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A & B

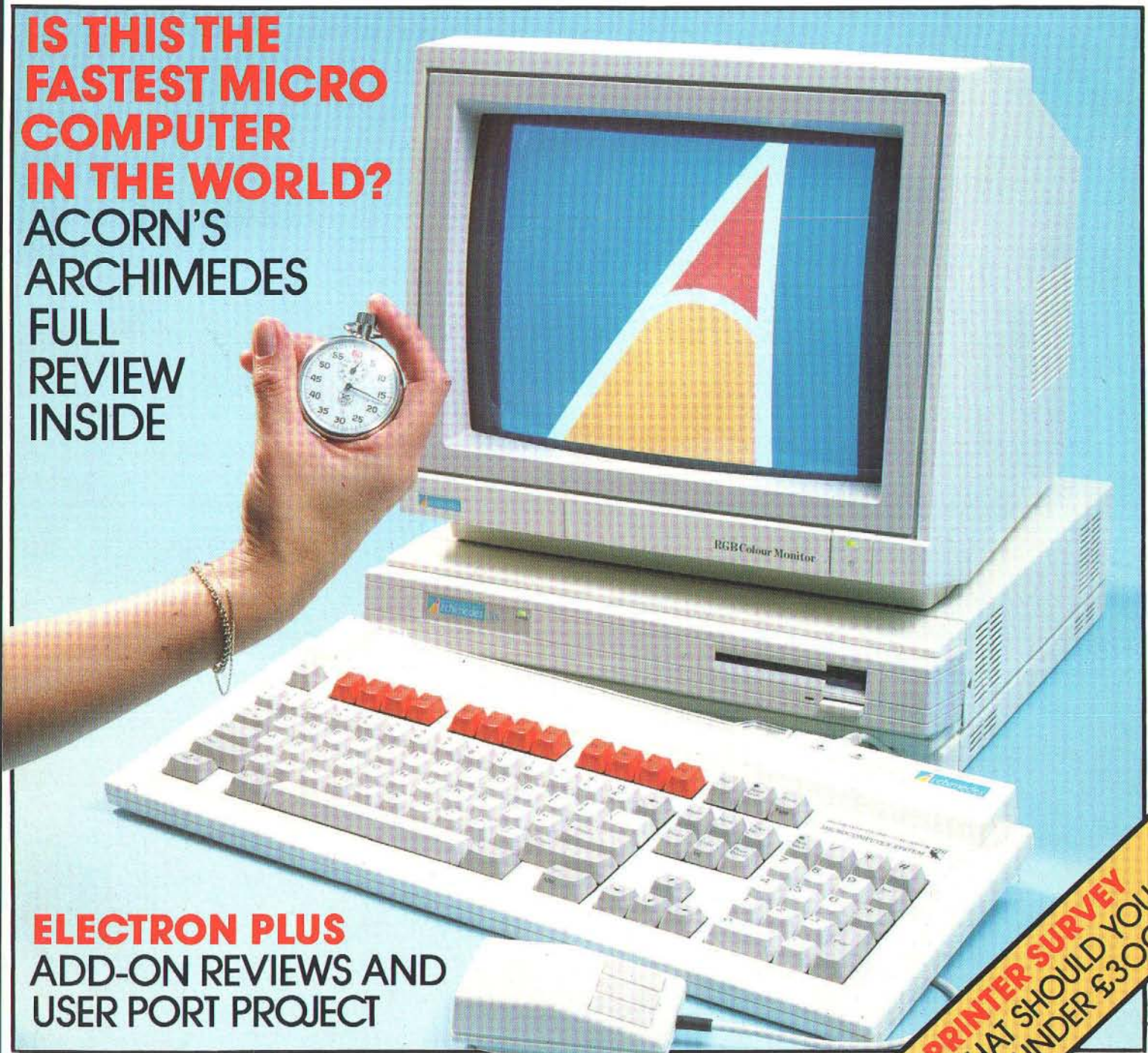
AUGUST 1987
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STRYKERS RUN



Commander Stryker under fire in the city



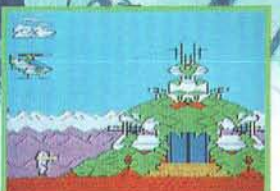
Battling in the air



An action close-up



Enemy equipment (Enhanced BBC Master version)



A camouflaged Battle fortress (Enhanced BBC Master version)

STRYKER'S RUN for the BBC Micro B, B+, Master, Master Compact, and Acorn Electron

Stryker's Run features probably the best graphics ever seen on the BBC Micro or Acorn Electron; the action is intense and the animation is superlative.

The battlefield graphics include cities, edifices, wrecked buildings, trees, gravestones, bridges, despatch-posts, military bases, helicopters and jet ships, with hills and mountains in the background. The Master-enhanced version also includes statues, watch-towers, a neglected cafe, a deserted cinema, aircraft hangars, aeroplanes, trucks and tanks.

For many years, a war has ensued between the Allied Nations and the Volgans. The battle was reaching a stalemate position, but recently the Allies through good intelligence work and some luck have managed to obtain the plans of the Volgan's next offensive. If the Allied Forces can capitalise on these plans they can end the impasse and the war. You play

the role of Commander John Stryker commissioned to take this top-secret information to the Allies' HQ.

Your character in the game can jump, run, duck, fire his laser pistol and throw grenades. He can also board aircraft and fly them, making use of their more powerful weaponry.

Your opponents, the Volgans, have a variety of weapons at their disposal comprising rifles, pistols, grenades, machine-guns, mortars, mines, helicopter gunships, rocket launchers and SAM missiles.

Stryker's Run is one of our most successful releases ever. It has topped the BBC Micro software charts for six weeks and received several glowing reviews: "The graphics are stunning... This should be in every collection" enthused A & B Computing.

Enhanced Version for the BBC Master Series

Stryker's Run is the first release to include a specially enhanced version for the BBC Master making use of its 128K of RAM. An extra 40K of detailed graphics are provided together with additional game features and atmospheric music.

BBC Micro Cassette.....	£9.95	BBC Micro 5 1/4" Disc.....	£11.95
BBC Master Compact 3 1/2" Disc.....	£14.95	Acorn Electron Cassette.....	£9.95

The screen pictures show the BBC Micro version of the game. The graphics of other versions may vary.



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Artroom SAVE UP TO £12.90

£30 5 1/4 inch Disc (ADFS ONLY) £34 3 1/2 inch Disc
With Digimouse add £35

The ARTROOM pack consists of ARTROOM and ACE (Artroom Colour Extension). ARTROOM is an icon based full screen graphics package which can be controlled by mouse or keyboard. All the usual features are there including 'cut and paste' and our highly acclaimed ZOOM option plus an extensive graphics library to help you produce pictures quickly. An advanced printer dump is also supplied.



'ARTROOM...the best there is.'—
Acorn User
Feb '87

'ARTROOM is the software for you.'
A & B Jan '87

ACE consists of two programs. COLOURIZER enables you to produce MODE 1 colour versions of ARTROOM screens and to dump them to a printer using a shaded printer dump. The MODE CONVERTER program will convert any graphics screen into a Mode 4 ARTROOM screen ready for loading into ARTROOM. Conversions can be made from Modes 0,1,2,5 and 7, yes SEVEN!

'...very pleased with the way Clares have introduced the colour facility.' A & B June '87.
ARTROOM and ACE will work with any mouse but we recommend DIGIMOUSE because it is well engineered using a non-slip ball and optical encoders. DIGIMOUSE also includes the unique 'LINEAR LOCK' facility that enables you to draw straight lines frechand.

'...impressed by Nidd Valley Digimouse' A & B June '87
This complete package is marketed by Olivetti in Italy, the home of style and design.

ACE A STROKE OF GENIUS!



BETA-BASE SAVE £7

£30 5.25 inch Disc £34 3.5 inch Disc

The Beta-Base pack consists of Beta-Base, the number one database for the BBC micro, and Beta-Base Utilities which extends the power of Beta-Base.

The main feature of Beta-Base is its ease of use which is achieved without sacrificing the power and flexibility required for the efficient manipulation of up to 65,000 records.

The Beta-Base Utilities provide seven new utilities. There are more powerful versions of Search and Sort and there is also a Mail Merge program which creates perfectly formatted letters containing data from your files.

'We use Beta-Base ourselves' Mike Bibby, Editor of MICRO USER.
'Rated best value for money'—ACORN USER Dec '84



RAMROD



UTILITIES PACK
SAVE UP TO £30

£50 5 1/4 inch disc £60 ROM £54 3 1/2 inch disc

The UTILITIES PACK consists of RAMROD and MACROM. RAMROD is the ultimate toolkit ROM and it is compatible with the whole BBC range and includes a disassembler plus editors for DFS, ADFS, RFS, memory, Shadow memory, Sideways RAM, Tube plus lots more. RAMROD will take you to the furthest reaches of your machine and enable you to boldly go where no ROM has gone before!

'an ingenious collection of utilities...' BEEBUG Oct '86
'worth its weight in gold.' A & B Jan '87

MACROM is a fast full featured MACRO ASSEMBLER that allows the use of macros, which are loaded from disc. MACROM has its own easy to use editor which automatically formats your source code. A HI version of MACROM is supplied for use with the second processor. A macro library and demonstrations are also supplied.

'Full marks for an excellent product.'—BEEBUG JUNE 1986

We are also making BROM+ available under this offer. Its main feature is the full scrolling BASIC editor which allows the user to edit a program as if dealing with text in a wordprocessor. There are many other features dedicated to making life easier for BASIC programmers.

'This is the best BASIC screen editor I have so far used.'
—MICRO USER August 85

For BROM+ add £25 on ROM,
£20 for 5.25 inch disc or £22 for 3.5 inch disc.

When ordering please state the following:

- Machine
- Disc size (5.25, 3.5)
- Disc format (40 or 80)
- DFS version

N.B. If ordering for a Master or Compact please state DFS or ADFS. The ARTROOM pack is for the Master or Compact only but all other software is available for all machines.

Fontwise + Pack SAVE £10

£34 3 1/2 inch Disc

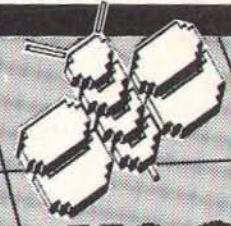
The FONTWISE+ pack contains FONTWISE+, the FONT EDITOR and 22 fonts. FONTWISE+ enables you to print very high quality text in a choice of 22 different fonts and 3 sizes. You do not need a special printer, just an EPSON RX or FX compatible. High quality is not the end of the story because you can also have both proportional and justified text. The output has to be seen to be believed.

FONTWISE+ is compatible with WORDWISE, VIEW, INTERWORD, MINI OFFICE II and EDWORD II.

'FONTWISE is better than many NLQ packages'—ACORN USER Sept '86
The FONT EDITOR is very easy to use and allows you to edit the current fonts or create new ones. Reviewers have praised the editor for its ease of use and faultless presentation.

'editor is impressively quick, smooth and easy to use'—A & B
EDITOR '...puts all previous designers to shame.'—BEEBUG July '86
Ask for a sample printout.

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A&B COMPUTING

**VOLUME 4 No. 8
AUGUST 1987**

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Back issue and subscription enquiries on 0442 48432. Software enquiries on 0442 211882

A&B Computing is published monthly on the first Friday of the month preceding cover date. Editorial and advertising enquiries to A&B Computing, Number One Golden Square, London W1R 3AB. Telephone: 01 437 0626. Distributed by SM Distribution Ltd., 16-18 Trinity Gardens, London SW9 8DX. Telephone: 01 274 8611.

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Typeset by Project 3

Cover design and design by the ASP Design Studio 01 631 3888

Printed by Riverside Press, Barnstaple, Devon

ISSN 0264-4584

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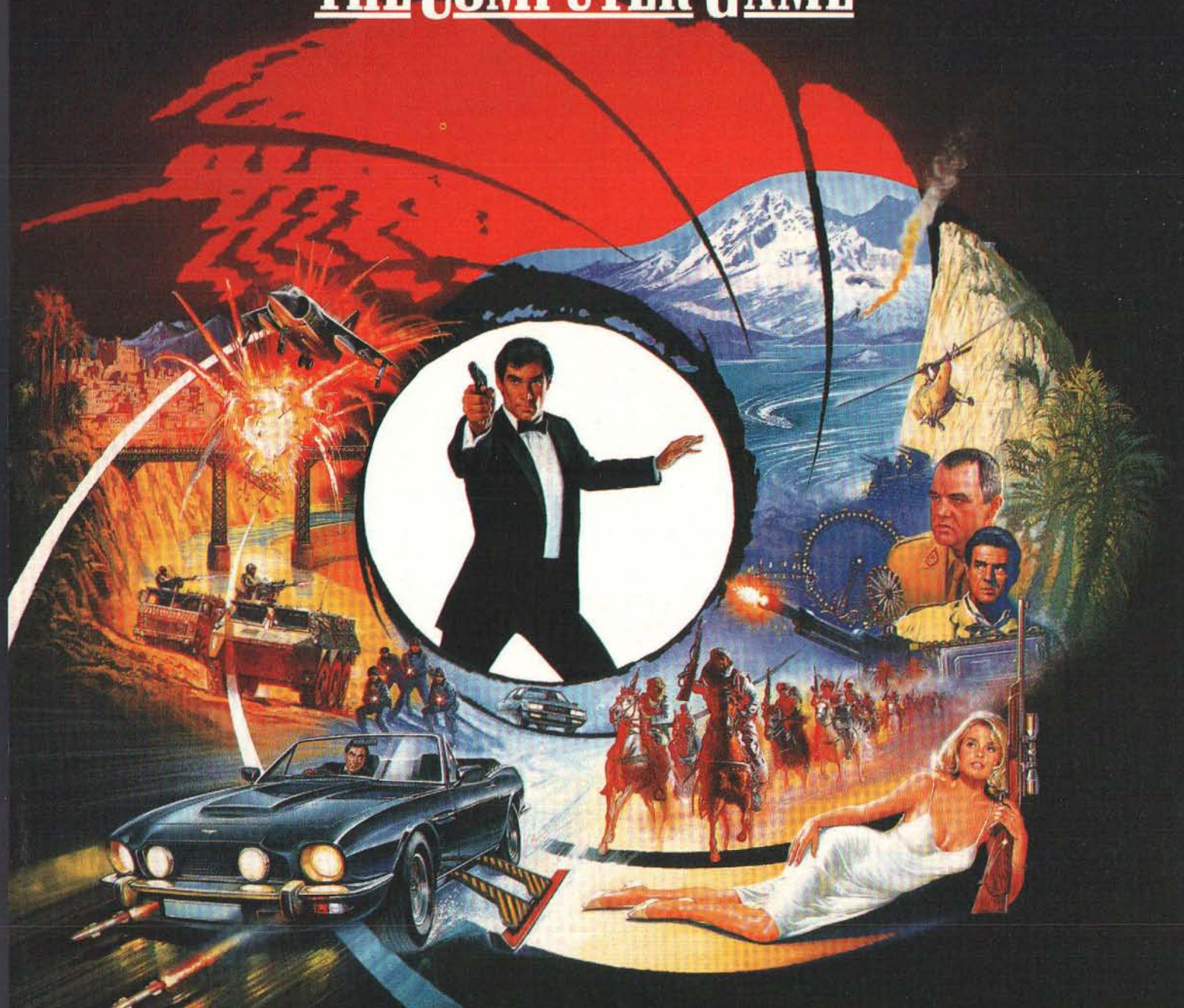
For anyone interested in astronomy, a computer program to tell you where to look. It could be the start of a new hobby! Model B/B+/Master Series

JAMES BOND 007[™]

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Produced by ALBERT R. BROCCOLI and MICHAEL G. WILSON Directed by JOHN GLEN Screenplay by RICHARD MAIBAUM and MICHAEL G. WILSON

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NEWS



"The Living Daylights"

New Bond movie "The Living Daylights" is to be transformed into a computer game by Domark, due for release in mid-July. Our picture shows the disappointed Domark team, just after failing the audition because their bus didn't have the required features ie skis which emerge from the sills, lasers in the alloy wheels, jet motor behind the rear number plate, guided missiles in the fog lamps and an auto-destruct mechanism.

Xor Demo from Logotron

Logotron are the people who brought A&B readers an exclusive preview demo of XOR in the February issue and the massive interest hasn't yet abated. In response Logotron are making demo copies available mail order for those who want to give the game a try. They cost £1.50 (which covers postage and packing) and

entitle the owner to a full copy of XOR for £9.95, discounted from £12.95. So you can't lose. Make postal orders or cheques payable to Logotron and send them along in an envelope marked 'XOR demo offer' to Logotron, Dales Brewery, Gwydir Street, Cambridge, CB1 2LJ. Tel: 0223 323656.

Pineapple ADU

Pineapple Software have released ADU, their set of utilities specifically aimed at the ADFS user. The ROM includes a number of *commands which can be entered in command mode. Alternatively the facilities are available through key presses in the ADU menu program.

*ADU sets up ADU as the current language with a full screen display of current directory and ROM information. Files on the disc are treated 'intelligently' by the software, eg BASIC files are CHAINED and machine code files *RUN. There is manual override on the

automatic settings.

The 'missing' ADFS utility commands such as *CATALL and *BACKUP are in ROM. *FORMAT and VERIFY are there for Master 128 owners. *DFSADFS converts files between the filing systems and *DISCEDIT is a very comprehensive disc editor. *DRIVE is included to increase compatibility with programs written with DFS in mind and *PWRBRK performs a reset.

ADU will work with ADFS on all BBC Micros. Price £29.00 + VAT. Details from Pineapple at 39 Brownlea Gardens, Seven Kings, Ilford, Essex IG3 9NL. Tel: 01 599 1476.

Computing course

Anyone interested in a computing and wordprocessing course at the South Warwickshire College of Further Education during the period 20-24 July should get in touch with Graham Winton for details. Tel: 0789

296696. The courses can be residential, based at the lovely Moreton Hall, set in over 500 acres of countryside. A relaxing way to go hi-tech by the sounds of things.

Debt Collection System

We aren't sure whether this will come as good news or not to our readers. It depends on their financial affairs or their profession, we suppose. For Acculaw Ltd have developed a debt collection system for the BBC Micro. Tom Hervey of Acculaw developed the software in response to badly documented and difficult to use 'professional' software running on business machines.

The current system requires twin drive Master Compact, Wordwise Plus and MP-200 printer with sheet feed. BASIC and Wordwise combine to process the large volumes of standard documentation involving the calculation of interest, costs and fees along with extensive letter writing.

The system should appeal to solicitors who have recognised the technical advantages of the BBC Micro over some business computers. There is likely also to be a considerable cost saving in using such a system. Details from Acculaw Ltd., 13 St. Mark's Road, Leamington Spa, Warwickshire, CV32 6DL. Tel: 0203 523215.

THE NEW AMX MK. III MOUSE. TRAP ONE SOON.

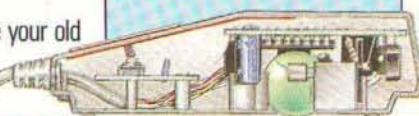


The MK III AMX Mouse is a product of Swiss precision and the result of a world-wide search to find a worthy successor to the AMX Mouse MK II.

The new Mouse has been specifically chosen to be the perfect partner to the ever expanding range of AMX software. The unique patented design includes high resolution D.P.I. and superior ball technology to ensure that contact between the Mouse and the surface is constant at all times.

There's a new shape too, that fits comfortably in the hand.

The AMX Mouse MK III costs only £34.99 or you can join the great "Mouse-Swap". Part exchange your old Mouse for the MK III for only £29.99.



* SUPERART

AMX MOUSE MK III. PLUS SUPERART 16K ROM, PLUS DISC £79.99

Acknowledged as the most sophisticated, yet easy to use paint package available for the BBC Micro, it's no wonder over 20,000 have already been sold.

'Superart' features include cut, copy, paste, move, rotate, plus many, many more such as fantastic spray and zoom facilities.

Available for BBC B, B+; Master 128, and Master Compact. Please state which version is required when ordering.

SUPERART (ONLY) £49.99

PICTURE GALLERY 2 x FLIPPY DISC £24.99

Instant art! A collection of fine drawings produced by acclaimed artists using superart.

* STOP PRESS

AMX MOUSE PLUS STOP PRESS 2 x 16K ROM, 2 x DISC £79.99

The most highly acclaimed desktop publishing software available for the BBC Micro. Already thousands of users are producing professional documents, newsletters, flyposters etc. in fact anything where text and graphics are required.

'Stop Press' comes complete with 16 variable typefaces.

Available for the BBC, B+ and Master 128. Please state which version is required when ordering.

STOP PRESS (ONLY) £49.99

EXTRA! EXTRA! 2 x FLIPPY DISC £24.99

300K fantastic clip art, over 25 fonts and utility software.

* MAX 16K ROM £19.99

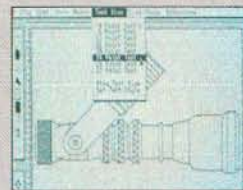
MAX provides an easy to use graphic based front end to your computer's disc filing system including a comprehensive set of disc management operations such as cataloging, copying, deleting and re-naming. You can also run programs from within MAX. Available for the BBC, B+, Master 128 and Master Compact. Please state which version is required.



* AMX DESIGN 32K ROM AND DISC £69.99

A highly sophisticated CAD package which allows the user drawings to be produced such as a simple PCB design up to the most intricate, architectural drawing.

Advanced features include full zoom and macro facilities, 58x58 screen canvas, full supported printer and plotter output. Available for the BBC, B+, Master 128 and Master Compact.



The additional AMX Software range that requires the original AMX Art Rom or Super Art Rom including: 3D Zicon normal price £24.99 Database normal price £24.99 XAM normal price £24.99 MindGames normal price £14.99. Total price - £89.96 but now available as a complete package at only £69.99. These superb products are available from all good computer dealers or direct by Cheque, Access or Visa. All prices include VAT and post and packaging.



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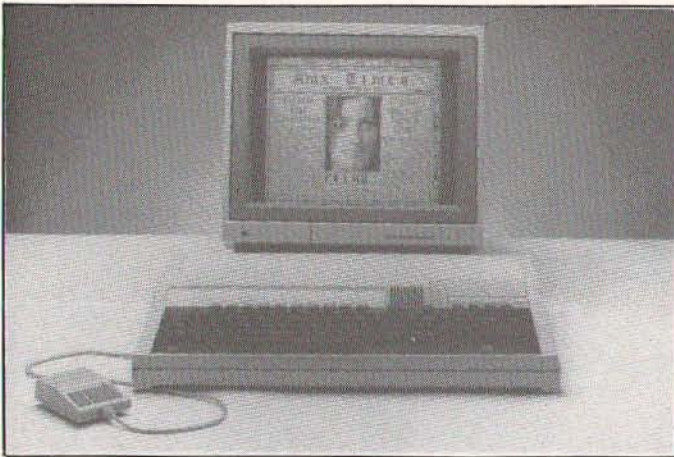
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EDUCATION

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AMX Mk III

AMS have chosen a Swiss manufactured device as the AMX Mouse Mk III for the BBC Micro. A unique patented design includes high resolution 250 dots per inch resolution and superior ball technology to ensure that contact between the mouse and the surface is constant at all times.

National News Day

July 9th 1987 will be National News Day, organised by the Microelectronics Education Development Unit and Times Network for Schools. It will involve the repeat of last year's mass publication by students of all ages of papers, magazines, on-line magazines, radio and video programmes. The Times Network is used to co-ordinate efforts.

The day will coincide with the MEDU publication 'Getting into Print — Desktop publishing with the BBC Micro'. TTNS are also publishing a case study 'Newspaper Simulation and GCSE'. The organisers are hoping to involve as many teachers and students as possible. Get in touch with Derek Maxted, c/o MEDU, Bishop Grosseteste College, Newport, Lincoln (0522 44713) or Helen Miller, TTNS, PO Box 7, 2000 Grays Inn Road, London, WC1X 8EZ.

Vine ROMboard

Master Series owners can now take advantage of Vine Micro's ROMboard 4 to squeeze more ROM based programs into their computer.

ROM board 4 supports four new ROMs, the user choosing whether these are to 'overlay' RAM banks or cartridge slots. By using ROM boards 3 and 4 together seven new ROMs — including Inter Series ROMs — can be installed.

A read-write protect switch is fitted as standard and Vine can supply further switches to link into either board allowing re-access to any overlaid utility

from outside the computer. Price of ROMboard 4 is £29.95 (inclusive). Details from Vine, Marshborough, Near Sandwich, Kent, CT13 0PG. Tel: 0304 812276.

PCW Show

Acorn will be lining up against the big names as usual at the Personal Computer World Show. Archimedes will be modestly taking all the attention away from Atari's mega floor space and the Commodore Amiga 'village'. Ticket price is £2.50.

World First

Minerva Systems claim a world first with their System Gamma programmable graphics package which allows the non programmer to generate sophisticated graphics.

Scatter, histogram, line and pie charts can all be defined and scaled by the user before being displayed on screen.

There is a statistics facility which includes line of best fit, maximum, minimum and standard deviation. Screens can be saved for customisation by user programs or the screen editor, which can be used to place boxes, labels and captions. Naturally data can be imported in any way desired from the System Delta Database System, and vice versa.

Single * commands can be incorporated into BASIC programs for custom programs. A pie chart, for instance, can be drawn with a single command. The package costs £45.95. Details on 0392-37756.

Lock out

Loktite systems is a new company specialising in the commercial protection of tape based software. Loktite claim to have both the best and the cheapest protection available and attempt to add protection to a piece of software within 48 hours of receipt and guarantee

7 day turn around. Other discounts apply for bulk purchase and regular custom and a demonstration disk can be obtained. For full details get in touch with Nick Evans, Loktite Systems, 91 Gloucester Road, Kew, TW9 3BA.

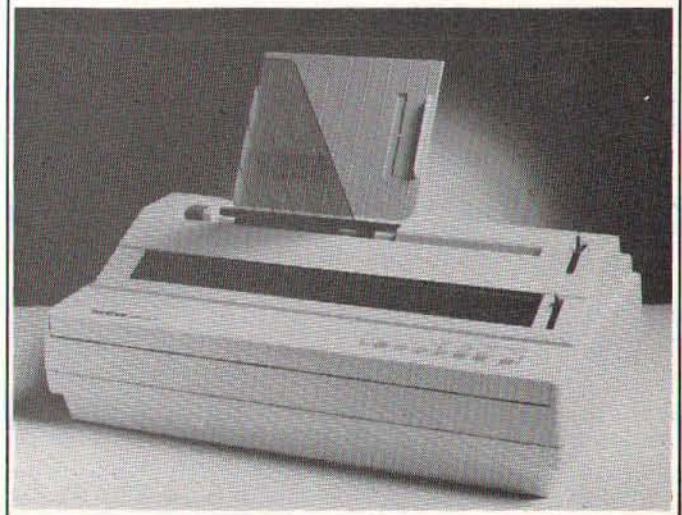
Search Continues

Superior Software's altruistic search for a star continues with adverts and booklets encouraging BBC programmers, young and old, to send their masterpieces to the number one BBC games house, who are now beginning to make a mark in other

machine formats. Watch out for new games for Archimedes in the autumn! If you are interested you can send for Superior's free booklet on the subject. Contact Superior on 0532 459453 and good luck.

Slimline Daisywheel

A 55 decibel daisywheel, the HR-40, cps printing, tractor and sheet feeder has been added to the Brother range as standard. at £995. It features dual interfaces, 40



BBC TO PC BY TUBE

Running co-processors was of course part of the original "Grand Design" of the BBC Micro. On learning of the plug-in 80186 co-processor for the Master Series, I immediately suggested an adaptor box to Acorn — only to learn that they were already considering it!

In the event, they were just beaten to market by Watford, who also coined the better name. Indeed, the official Acorn name is hard to take — the Universal Second Processor Unit — just when we were learning to call them co-processors!

Nevertheless, I am pleased to see the idea doubly endorsed. I have already reviewed the Watford Co-Pro Adaptor (*A&B*, April 87), and obviously most of it applies also to the Acorn unit. However, this article goes further — especially in considering the suitability of software. The Acorn unit costs £75 plus VAT, and is available now.

The hardware

The box is very familiar in appearance — being externally identical to all the other Acorn co-processors — the 6502, the Z-80, and the 32016 Acorn Cambridge Co-Processor. It takes co-processor boards designed for the Master 128 — of which Acorn offer two — the 65C102 "Turbo", and the 80186 with 512K, used in the Master 512. The adaptor can be used perfectly well with a Master 128, and is useful for attaching such a co-processor, without having to open the machine, or to handle the board. It also enables a second co-processor to be attached, if one is already fitted internally. However, the main purpose of the adaptor is to make the "Master Series" co-processors available to the very many users of the Model B.

The Acorn co-processors (and the present adaptor) have very short data leads, which means that they must be positioned right alongside the BBC Micro. Yet, for those who are right-handed, this is the ideal position for a notepad. It is also just where such a user would want to run the "mouse", which is almost essential when using the GEM applications. (*GEM Desktop*, *GEM*

Write, and *GEM Paint* are supplied with the co-processor, together with a mouse.) Fortunately, the situation has improved. Earlier Model Bs with Issue 2 and 3 main boards are probably still limited to the short lead for reliability — although a 1ft/0.3m extension may prove to be possible. However, later Model Bs with Issue 4 and 7 main boards can probably accept a 3ft/1m extension. Certainly this was true of my Issue 7 machine. It should be possible to buy such a lead — with the special connectors — for about £5.

Acorn's own "Co-Pro Adaptor" allows the 80186 Co-Processor to be connected to the Model B

Like the other Acorn co-processors, the new unit has its own mains power switch. This allows it to be disabled, without disconnecting it from the Model B. (In the case of the Master 128, co-processors can also be disconnected via software, and this status is stored in the battery-powered CMOS RAM non-volatile memory.)

Use with the Turbo

The 65C102 "Turbo" co-processor presents no hardware problems when used with the Model B. All the software is designed to use only the Model B keyboard. Indeed most of it was written for the earlier 3 MHz 6502 Co- (then Second-) Processor.

The main purpose of this was to overcome the very tight memory constraints of the Model Bs (especially when using

Modes 0 to 3, and when fitted with disc interfaces), in the days before shadow RAM. However, to use this co-processor requires that the "language" ROM(s) — eg BASIC or word processor — be "Tube-compatible". This means that it should at least copy directly across the Tube, to the same position in the Co-Processor memory. This gives 30K available to the user at all times — although the Master Series achieves nearly the same with shadow RAM and private RAM.

In addition, some "languages" have been designed to locate higher in the memory of the co-processor than in that of the Model B. Some are supplied only on disc, but a minority achieve this by automatic re-location of the ROM code. The former include BBC BASIC (as Hi-BASIC), with 44K available to the user, and View (as Hi-View), which — because it is less than 16K long — allows 47K to the user. The latter include the Ultracalc spreadsheet, and the version of View built into the Master 128. However, the appeal of this co-processor has diminished as application programs have grown beyond the 16K maximum that can readily be copied across the Tube. Furthermore, there are ROM-based applications which fit in a single 16K socket, but hold 32K (eg Inter-Word), or even 128K (eg Spellmaster), by means of internal paging, which prevents their use with a co-processor.

A secondary purpose of such a co-processor was to provide higher processing speed — 3 and now 4 MHz, in place of the standard 2 MHz. However, the need for this has fallen as programmers have become more skilled at writing faster-running code, (eg Inter-Word) and 4 MHz processors have become available (from Solidisk) for fitting inside the Model B.

Use with the 80186

Users are beginning to realise that, in a Model B or Master 128, with a monitor, dual double-sided, 80-track disc drives, and ADFS, they already have most of a PC-type

C O N T I N U E S ►

A C O R N C O - P R O C E S S O R

computer. Moreover, the 80186 co-processor, with 512K of RAM, and the DOS Plus operating system provides the remainder, with a surprisingly high degree of compatibility with the IBM-PC. Even with the adaptor needed for the Model B, the upgrade still costs less than a low-price PC-clone, while retaining the ability to run all the original BBC Micro (6502) software, and to use the 6502, Z-80 and 32016 Co-Processors.

The 80186 is already faster than almost all the PC-clones — almost four times as fast as an ordinary IBM-PC, and also quicker than the Amstrad PC1512 (eg when recalculating spreadsheets). In addition, it can now be bigger in memory capacity as well (see below).

Although the Acorn 80186 is bundled with the GEM Collection (Desktop, Write, and Paint) and a mouse, it can still give you the normal command line, with A). Indeed, it can use an Acorn or compatible Winchester hard disc, to give you C). Forgoing GEM not only releases about 130K of RAM, but also allows access to a far larger number, and wider range, of software packages — both programming languages and applications. Although larger environments for languages are already available from Acorn, in the shape of the Acorn Cambridge Co-Processor (with 1 MB) and the Acorn Cambridge Workstation (with 4 MB), with the Pandora and Panos operating systems, useful work can still be done with DOS machines such as the 80186, especially if you can find versions of the languages which are not constrained to a single segment of 64K.

However, it is for applications — particularly for business — that DOS is unquestionably the leading micro-computer-based environment. Six years after the launch of the IBM-PC, there is a huge volume of software for it and compatibles — well over 10,000 packages. Moreover, a large amount is in or near the public domain — “freeware” and “shareware” respectively — or sells at modest “Amstrad” prices.

Using the 80186 with the Model B, by means of an adaptor, enables adding DOS capability at lower cost than upgrading to a Master 128. However, there are some disadvantages, such as a less good screen display, and actual shortcomings, such as the lack of a numeric pad (to match that of the IBM-PC), which limits the choice of software.

Hence, in selecting software for running on the Acorn 80186, with a Model B, there are two hurdles:

- finding that which performs well on the Master 512. Acorn have a list, (as published in *A&B*, February 87, p13), and there have been brief mentions in my description of the Master 512, (see *A&B*, July 86), and in Jon Vogler's recent survey (*A&B*, May 87)
- considerations due to the Model B

keyboard, as mentioned in my full reviews of DOS packages — Words and Figures (see *A&B*, May 87), and now Ability (see this issue).

Against this, there are more packages to choose from than for any other machine and operating system. As in my description of the Master 512, the software may be divided into three main groups:

- that which is generic for the MS-DOS or CP/M-86 operating systems, and generally text-based
- that which includes graphics, and is therefore machine-specific — eg written for the IBM-PC
- that which is written for the GEM Virtual Device Interface, which is supposed to make it hardware-independent.

The suitability of all these packages for running on the Acorn 80186 depends on the features used (keyboard, screen, floppy disc controller, serial port, mouse), the quality of the emulations provided, and the availability of device drivers. It can also depend simply on the amount of RAM available.

One possible cause of incompatibility is the floppy disc controller, as illustrated by the two versions of 1-2-3. Version 1.0 A uses protection (against copying) only via the operating system, and the original discs can be read by the Acorn system. However, Version 2 writes directly to the floppy disc controller. Since many “power” users now have hard discs, products have emerged which “unlock” such applications, in order to avoid the need to use the floppy as a “key” disc. Indeed, the tendency is for disc protection to be used much less. Hence the latest version of such a package may well run on the Acorn 80186, where an earlier version would not.

Other classes of application (or functions within applications) are “lost causes” as far as the Acorn 80186 is concerned. These include many of those using the serial port (especially for comms, but also for printing and plotting), and all those using sound effects. In both cases, the applications often write directly to the hardware, which differs radically from that in the IBM-PC. In the case of the serial port, the symptom is often that the machine “hangs”, and has to be reset, and DOS Plus re-booted, whereas with the sound system, it is merely silent (as in the case of “Flight Simulator”).

However, the Acorn 80186 will run some applications of all these types (with reservations) and the position continues to improve.

Firstly, the Acorn implementation of DOS-Plus is far better in emulating the MS-DOS environment than, for example, the version of DOS-Plus supplied with the Amstrad PC1512. Proof of this is the ability of some programs even to run in all respects, and then the speed with which eg calculations and screen scrolling is done.

This is not just a matter of processor speed (though that of the 80186 — at 10 MHz — is notably high), but also of the support for the low level calls that programmers use for speed.

The second is the just-announced memory expansion for the Acorn 80186 — the PC Plus, from Solidisk. Expressed in terms of the IBM-PC, running PC-DOS/MS-DOS, the Acorn 80186 running DOS-Plus has only 422K. However, an increasing number of applications require 512 or the maximum of 640K. The PC Plus doubles the total amount of RAM from 512 to 1024K, and increases the space available after loading DOS Plus, from 358K to 702K (see *Doubling DOS*). The latter is equivalent to some 768K — 128K more than for any IBM-PC or AT running PC-DOS/MS-DOS. The Acorn adaptor unit has plenty of room for the PC Plus memory expansion (as has the Watford Co-Pro Adaptor, and the Master 128 itself).

In addition, the Acorn machines are better-suited for running some software than the IBM-PC itself. For example, the Model B and Master have always had their 10 function keys in a horizontal line. This is a far more practical arrangement than that used originally by IBM — especially for applications such as GEM Write, Volkswriter Deluxe, and Volkswriter 3, which use them at several levels (alone, and with (SHIFT), (CTRL), and (ALT)). In particular, it is far easier to devise a readable keycard. Easier use of the function keys can reduce the need to resort to on-screen help, or pop-down menus. IBM have since adopted a similar arrangement!

Generic

This includes versions of “standards” such as Wordstar and dBase II. Where available, they have the advantage of being able to use the so-called “native” screen mode — 7 as implemented for the 80186. This uses the Mode 3 of the BBC Micro, which provides a highly legible 80 x 25 text display, with spaced lines (hence no graphics). The relevance of this category continues, because the IBM-PC version may use the “brightness attribute” for the main part of the screen displays. Since this is not supported by the BBC Micro, and hence by the Acorn 80186 system, it has been emulated by a “bold-for-bright” character set, which is somewhat less legible than normal. However, such versions seem to be a dying breed, as more are written specifically for the IBM-PC and the “clones”. (Eg Wordstar 3.3 was available in both Generic and IBM-PC versions, but Wordstar 3.4 and later is available only for the IBM-PC.)

Another reason for continued interest in this category, is the large volume of software that is written by end-users (mainly in the academic world) in languages such as

Fig. 1 DOS APPLICATIONS on 80186 with Model B

Application	Version	Type	Display	Remarks
Generic				
Wordstar	3.30	WP	Normal	All functions available
IBM-PC				
1-2-3	1.0A	SS/BG	Normal	(Protected, but runs) No Home, End, but GoTo (Needs "unlocking")
1-2-3	2	SS/BG	Normal	No Home, End, but GoTo
Ability	1.2E	WP/DB	Normal	No Delete, only Backspace Hence some functions lost
dBase II	2.3D	DB	Normal	All functions available
Logistix	(Demo)	SS/BG	Bold	No Home, End, but GoTo
PC Promise	(Demo)	DB	Bold	Many functions lost
PC Write	2.60	WP	Normal	Insert mode only Some functions lost
Supercalc 3	2.1	SS/BG	Bold	No Home, End, but GoTo
Turbo Lightning	1.01	Spell	Bold	(Inside IBM applications only) All functions available
Volkswriter 3	1.0	WP	Normal	Overwrite mode only
Volkswriter DL	2.2	WP	Normal	Overwrite mode only
VP Planner	1.0	SS/DB	Normal	(With loader program) No Home, End, but GoTo in SS
Words & Figures	1.01	WP/DB	Normal	Overwrite mode only in WP
Wordstar	3.30	WP	Bold	No Home, End, but GoTo in SS All functions available
GEM				
GBase		DB	GEM	(Needs RAM expansion) Overwrite mode only No Delete, only Backspace
GEM Desktop	2.0	Shell	GEM	All functions available
GEM Graph	1.0	BG	GEM	Several editing functions lost
GEM Paint	2.0A	P	GEM	All functions available
GEM Write	1.01	WP	GEM	All functions available

Fortran and Pascal. These are usually text-only, and can often be run from with the same simple 80 x 25 display.

IBM-PC

This numbers well over 10,000 packages, notably including business applications, but also just about every other field of computing, from games to CAD.

The Acorn 80186 supports graphics as well as text modes (just as does the BBC Micro). However, emulation of the IBM-PC screen modes is limited to a subset of those provided by the Colour Graphics Adaptor. The main constraint is that 16K of video RAM only suffices for 640 x 200 x 2 colours, and 320 x 200 x 4 colours. However, many applications have "configure" or "install" options for the colour graphics adaptor, connected to a monochrome monitor. If available, this should be chosen, as it corresponds exactly to the display provided by the Acorn 80186 system.

In addition, the Acorn emulation includes excellent support for the low-level calls that programmers use to speed screen handling. Thus IBM-PC versions of Wordstar scroll much faster, (and without "break-up") on the 80186, than on the IBM-PC with CGA itself. Of course, this is partly a reflection of the higher speed of the processor, which more than overcomes the penalty of the co-processor architecture of the Acorn system.

The other main area of concern — especially when using a Model B — is the emulation of the IBM-PC keyboard. There has been a significant improvement in this between Release 1 and Release 2 of DOS Plus. The latter now supports the entry of

the upper 128 ASCII codes as Alt plus numbers on the numeric pad, and also supports the Insert and Scroll Lock keys, as used by Words and Figures (and 1-2-3). Unfortunately, none of these are available from the Model B keyboard.

A certain number of applications (and games) have been designed to be run also on the IBM-PC jr. This has since been discontinued, but is relevant here because it too lacked a numeric pad.

Although not supported fully by DOS Plus, certain applications can be "helped" into running with a short "loader" or "support" program. One example supplied by Acorn is the VPP loader program for VP Planner, on the Miscellaneous disc.

GEM

Since the GEM VDI is supposed to be machine-independent, and the 80186 is supplied with the GEM Collection, it may be assumed that there are no compatibility problems with such software. This is of course true for the Master keyboard, and — helped by (CTRL)letter keys, and the mouse and pop-down menus — also for the Model B. However, as Figure 1 shows, GEM Graph depends on the numeric pad for several vital functions. Moreover, GEM is neither a single, unchanging standard, nor always perfectly utilised by programmers. I hope to expand on this later.

Discussion

Figure 1 summarises the information I have to hand. It is preliminary, in that I have so far done full reviews (exploring a reasonable range of their functions) only of Words and Figures and Ability. For the rest, I have

looked quickly at the most crucial points — the display, and such things as dependence on the Insert and Delete (right, as opposed to left) keys, and on the Home and End keys — all of which are on the numeric pad of the IBM-PC, which is not matched on the Model B. (They are available on the Master 128 keyboard, when it is used with the 80186).

"All functions available" means that essential functions, such as Insert and Delete, are available either via (CTRL)letter combinations or — in the case of GEM applications — on a pop-down menu (and sometimes both — as in GEM Write).

The Home and End keys (although highly convenient) are not essential, since their function can be approximated — for spreadsheets, by eg GóTo cell, and for both these and word processors, by Arrow and Shift-Arrow, and sometimes by Ctrl-letter combinations (as in Wordstar and Ability).

Conclusions

Figure 1 shows that any of a number of spreadsheets — including 1-2-3, and the "clones" VP Planner and Words and Figures — may be run satisfactorily from a Model B. For word processors, if you are content to write in one mode — overwrite with Volkswriter Deluxe and Volkswriter 3, and Insert with PC Write — then this extends your choice beyond Wordstar and GEM Write. For databases, your choice includes at least dBase II (and may include dBase III Plus in unprotected form), as well as the spreadsheets, which are all capable of holding and manipulating datafiles — albeit usually in memory.

Among integrated multi-function packages, Ability is offered at an excellent price (see *Multiple Capability* in this issue). Unfortunately, although Insert is available, the lack of Delete is especially important in this case. If you want to run it from the Model B, you could either urge Migent to implement eg (CTRL) for Delete (as Wordstar) as I have done. Otherwise, you will have to trade up to a Master 128, which allows virtually everything except the Comms module and serial printers to run on the 80186.

Even so, it is now entirely practical for spreadsheets to be developed and run with Lotus 1-2-3 on a PC in the office, and with Words and Figures on a 80186 at home. Similarly, letters and reports can be written equally well at home using GEM Write, as at the office using Wordstar. (GEM Write uses many of the Wordstar keystrokes, and can produce files in Wordstar format). Thus the Acorn adaptor allows the Model B user to "journey from BBC to PC" (and back again) at a remarkably modest cost. However, the fact remains that trading up to a Master 128 (with its numeric pad) often provides greater convenience, as well a much wider choice of software.

RED KEYS REMAIN

Archimedes is without question new technology, the first time that a RISC (Reduced Instruction Set Computer) has been used in a low cost microcomputer.

Archimedes is important to Acorn in two distinct ways. Firstly it is at the same time their latest addition to the BBC Microcomputer range and their own successor to that 8 bit technology. The 300 series starting at '799 carries the name and the red keys and little else from 1982. Secondly it is their showpiece for RISC itself, the Acorn designed chip, manufactured under license from Acorn in the United States. Archimedes is a shop window display for other manufacturers who might wish to incorporate RISC into their products, micros, laser printers, interactive video consoles and so on.

The opposition

That's for the future; Archimedes will be available for all to buy in September. By then it's fairly safe to assume that the competition will still be the Atari ST and the Commodore Amiga 500, both based on 68000 processors. It's educational to look at the development of these similarly high powered computers to put Archimedes in perspective.

**Archimedes
was the
outstanding
engineer of his
time and
Acorn's
Archimedes
may turn out to
be one of the
outstanding
bits of
microcomputer
engineering of
ours**

The Atari ST is now too cheap in its basic form to be in direct competition. The Amiga compares on colours, resolution and stereo sound and is closest in price. Archimedes has the edge on variety of screen modes, number of colours on screen and, with special monitor, resolution. The Amiga has two chips dedicated to handling screen graphics (the blitter is a very reduced instruction set processor!), Acorn has VIDC. Based on multi-windowed demonstrations I have seen on Archimedes, RISC appears fast enough to compete on graphics speed in some respects but not in animation. Much, of course, depends on the programming.

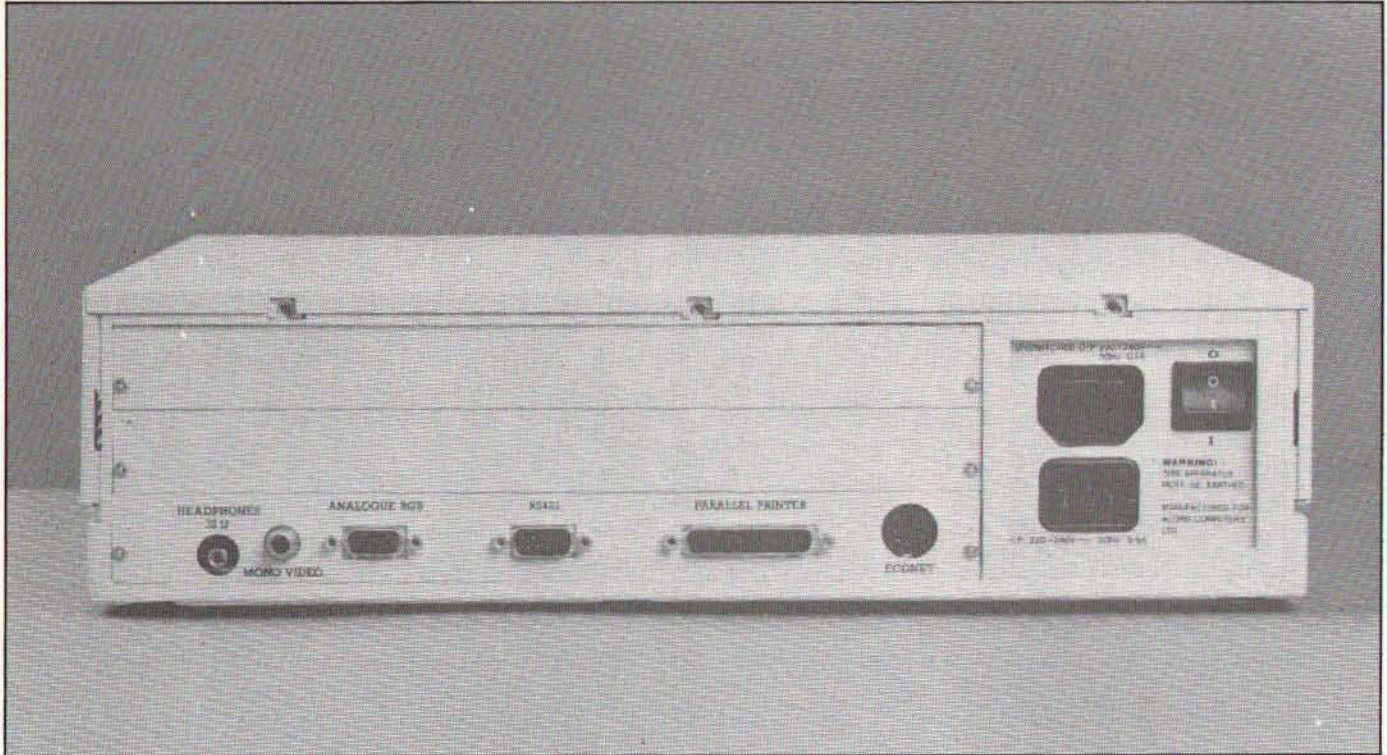
Archimedes has seven stereo sound positions, eight channels on each, the Amiga four channels in four positions but dedicated digital to analogue hardware for a better quality sound.

The Amiga's operating system has been tweaked consistently over the past two years and it is possible that Archimedes will also see revisions in its software. If not, then Acorn will have done a remarkable job because the task is very complex. The window management system appears to knock spots off GEM for speed and Acorn have built in "Microsoft Windows like" hooks for software developers.



The keyboard features LEDs beneath the keys and 12 function keys. The mouse plugs into a port in the top right-hand corner

A R C H I M E D E S



Rear panel, note the two power supply plugs to cope with international requirements

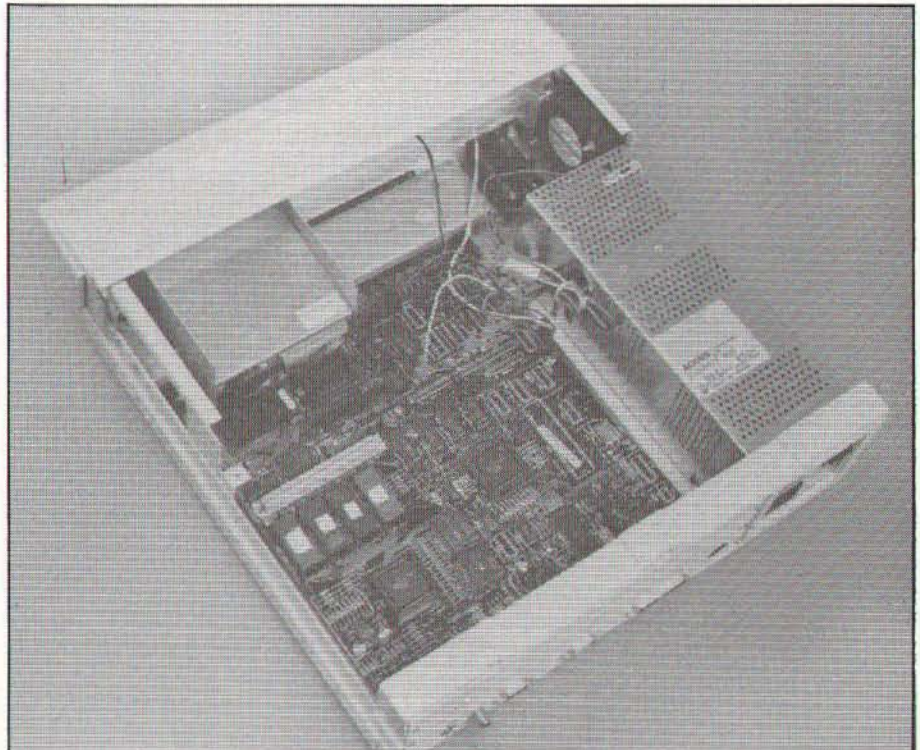
Although not multitasking like AmigaDOS, sheer speed gives the appearance of processes going on simultaneously in different windows as the RISC processor switches rapidly between each task. Both operating system, language and window management is in ROM on Archimedes, the rivals are still loading up the last two from disk.

Where to now?

Acorn's business sense tells them to look at where IBM is going and to take their technology in a similar direction as far as operating systems and WIMP environments go. The Acorn badged 400 series computers will undoubtedly have other operating systems ported over to them, UNIX included and that means multi-tasking with multi-user potential. These systems may take Acorn into new markets but what's equally important is the application of RISC for its existing users at home, in business and in education.

The fact that you can plug a standard Master Econet module straight in shows instantly how Archimedes can fit in with existing BBC users. The power becomes more widely available, the cost per user greatly reduced. There are 7,500 Econet installations ready to take advantage.

A further very attractive feature of Archimedes against all rivals is that you will be able to run existing software while the inevitable software "gap" is filled by both established and brand new software publishers. Correctly written BASIC programs will work on BASIC 5 and Arthur, the BBC lookalike operating system. They can be quickly enhanced to take advantage of the new hardware. Some may choose to temporarily run applications



The printed circuit board. The four large square 'packages', RISC, VIDC, MEMC and IOC are clearly visible

written in machine code with the 6502 emulation while awaiting the new applications from people such as Computer Concepts, AMS, Clares, Minerva and the boys from the PC and 68000 world writing in Pascal and C for portability.

There will be no lack of software for this machine. How much it will cost is another matter. The experience in the ST and Amiga market is that, as the quality goes up, so does the price. The packaging of Elite and Revs pales

into insignificance against some of the current American software. Archimedes may be a luxury model BBC Micro but anyone who reads Jon Vogler's business column will be aware that quantifiable gains in productivity can be made by investing in the new generation micros. And apart from that, all the games programmers are expressing great interest with Jeremy San (Starglider) and David Braeburn (Elite) already at work on new games. Can you resist?

A C O R N A R C H I M E D E S

A is for Archimedes

Archimedes is an elegant 'three box' system

The first affordable 32-bit computers — for business, science, and the home — are also the fastest, by far.

This is not a review, but a preview of the new A series — permitted by Acorn in response to the intense interest — notably from owners of the 8-bit Acorn machines (Atoms, Model Bs, Electrons, Master 128s and Compacts), which now number some 750,000. It is based on the considerable body of literature available to hardware and software developers, in addition to early drafts of that which will be supplied to users. I also spoke at length with some of the key people involved, who answered questions and explained the many new concepts embodied in the new machines.

The range

The new A series are 32-bit computers, as are most mainframes. The A300 series consists of two models, the A305 with 512K of RAM, and the A310, with 1 MB (1024K). In addition, both will have 512K of ROM. They are badged as BBC Micros, and correspond in effect to the Models A and B of yesteryear, albeit with 32 times as much RAM.

Above these come the two models of the A400 series — the 410 with 1 MB of RAM, and the 440 with 4 MB. Both will have 512K of ROM, and the circuitry on the main board to support a Winchester hard disc drive. The boards thus differ from those of the 300 series, but much of the design is common to the whole range. The A440 will have a 20 MB drive fitted as standard — it being judged essential with so much RAM. They will be sold under the Acorn name, and — like the 300 series — are expected to open up many new markets.



A C O R N R I S C M A C H I N E



Red keys remain but the keyboard is now an international standard layout

Hardware

Keyboard and Mouse

The keyboard is detached — like those of most comparable personal computers eg Atari Mega ST, Amiga 2000, Apple Mac, IBM-PC, and the Acorn Cambridge Workstation. There are 103 keys in a layout almost identical to that of the new IBM 101 keyboard. By dividing two keys of the “US” layout, Acorn has added keys for a pound sign to the main group, and for a hash sign to the numeric keypad (see Figure 1). The 12 function keys are numbered f1 to f12, and are coloured red, as usual, on the 300 series, but the Print Screen key is also

programmable, and can act as f0. The Caps Lock, Num Lock, and Scroll Lock keys have red Light Emitting Diodes (LEDs) — actually below the keys, with lenses in the keycaps. There is a recessed Reset key at the right rear of the keyboard.

A neat coiled lead connects the left rear of the keyboard to the right front of the system box, ending in a “mini-DIN” plug. The mouse plugs into the right rear of the keyboard, again with a mini-DIN plug. It has three buttons, for maximum versatility.

Monitor

The normal monitor that Acorn supply is the same as that used with the Master Compact. It has a 12 inch (diagonal) screen, and a dot

pitch of 0.43 mm. However, the video is RGB-linear, fed via a lead with slightly different connections. This is needed in order to handle any number of colours (the A series can produce 4096 different ones — though not all at once), whereas RGB-TTL is only capable of displaying eight different (steady) colours.

System box

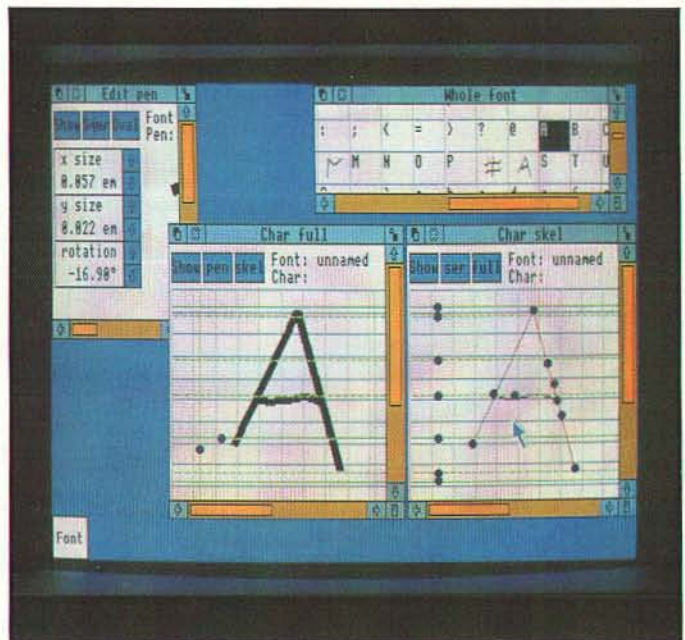
The design of the system box is exceptionally clean and logical. The case is of steel, which is clearly a help for shielding against Radio Frequency Interference (RFI). It is also strong enough to carry a colour monitor. The power supply is large, but the components inside are well-spaced, and the case is slotted for ventilation. It is located on the left, as usual for Acorn machines, with the main power switch at the back. Just above this is an unswitched 3-pin socket for the monitor. Also at the back are sockets for audio, video, serial, (parallel) printer, and Econet. At the left front of the box is the battery “nest” for 2 “AA” cells, with the speaker on the side wall above. To the right is a metal bridge, which carries the disc drives — one 3.5 inch floppy and (optionally) a second 3.5 inch floppy or a 20 MB Winchester hard disc. The floppy drives are tilted up at about 15 degrees to make it easier to insert and remove discs when the keyboard is close. There is a small fan in all the machines. This is a marginal requirement for a standard, unexpanded machine, but is needed if add-on “podules” and/or a Winchester hard disc drive are fitted internally.

The circuit board has a simple rectangular shape, and four layers (or planes) of conductors. Although there are fewer devices thanks to the proprietary chips, with 32 bits instead of 8, there are typically four times as many connections between them. Also the

Desktop applications are available in ROM.



The graphics based fonts are fully definable



C O N T I N U E S ►

A C O R N A R C H I M E D E S

requirements in respect of RFI have tightened, and having continuous planes for ground ("earth") and power helps in this regard. The RAM chips are ranged across the front of the board. The A305 has 16 (64 x 4) chips soldered in, with a row of 16 empty sockets behind — and so it can be upgraded to a 310. Similarly, a A410 can be upgraded to an A440.

Proprietary chips

Like most other modern computers, the A series contains proprietary support chips. These are a major safeguard against "cloning", as well as reducing size, cost, and power consumption, and increasing reliability. However, unlike all their competitors (IBM, Apple, Atari, and Commodore), Acorn also designed the central processor chip used in the new machines. This means that it has been possible to meet design objectives with much greater freedom.

Processor — ARM

Complex Instruction Set Computers (CISC) processors such as the Motorola 68000 or Intel 80 x 86 resort to "micro-code" (fast, on-chip ROM), and the instructions take more than one clock tick on average. Conversely, Reduced Instruction Set Computers (RISC) processors are designed for optimum speed. The instruction set is minimised (reduced from previous practice) by analysing which are really needed (by the interpreters and compilers of high-level languages, such as BASIC, and 'C').

The less-frequent operations are performed by combinations of these essential instructions. It then becomes practical to "hard wire" all their logic. This, together with the "pipelining" of instructions, so that typically three are in different stages of being processed, allows the "ideal" of one instruction per clock "tick" to be approached. Both are major features of the "Acorn RISC Machine", or "ARM", which delivers astonishing throughput, even at modest clock speeds. For example, where the 68000 at 8 MHz achieves 2 million instructions per second (mips), and the 68020 at 10 MHz achieves 2 to 3 mips, (both at an average of about 4 ticks per instruction), the ARM at 8 MHz achieves 4 mips (at an average of about 2 ticks per instruction). Hence the CISC processors either have a lower throughput (in mips), or need to be clocked faster. Eg a 68020 machine would have to be clocked at 16 MHz in order to achieve a throughput comparable to that of an ARM machine at 8 MHz.

This in turn requires faster, more expensive RAM chips, whereas the ARM allows the use of lower cost RAM chips for a given throughput. Furthermore, RISC design results in a very much smaller and less complex device. The ARM has only 25,000 transistors, whereas the 68020 has 192,000. Hence the ARM was much easier

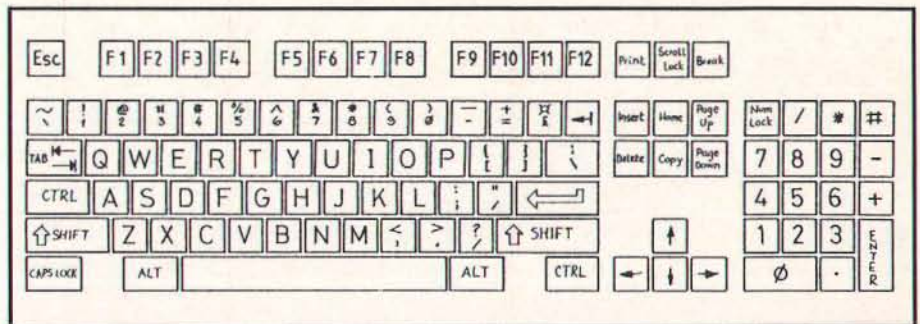


Figure 1 A series keyboard layout

to design, and to make at a high yield — and is estimated to cost only one tenth as much.

Modern micro-computers must be able to manipulate parts of graphics screens, up to the whole, while offering ever more spatial and colour resolution. The Model B was very advanced for its day (1981), with up to 20K devoted to the screen. Yet the A series uses up to 160K, and makes much more use of graphics, eg, for the Window Manager. Hence a lot of attention has been paid to "bit block transfers" or "blitting".

Firstly, the ARM, with its 32-bit data bus, is able to manipulate data with half as many instructions as the 68000 or 80286, which have only a 16-bit data bus. In addition, the ARM processor differs fundamentally from the 68000 used by most of the machines which provide "blitting" with additional hardware. (The IBM-PC does not, but it is an expensive option on the new PS/2 series). When a 68000 issues a "bit block transfer", it then thinks about other instructions, which can take typically six "clock ticks", and sometimes many more. This gives an opportunity for the data bus to be used by a special co-processor known as a "blitter".

However, the ARM accesses the bus at least every other clock tick, on average, and can carry out block data transfer operations very fast through the use of its many registers. Hence not only is there little or no time for a "blitter" to take over the bus, but neither is there any need. In addition, Acorn have provided a very powerful capability for handling "sprites", which may be of any size and colours (of those available in the current screen mode) (see below).

Memory controller — MEMC

With 512K of ROM, and 512K of RAM, even the new A305 has more useful memory than any IBM-PC, with 64K of ROM, and 640K of RAM, plus 4, 32 or even 256K of video RAM. Acorn have thus jumped from the 64K addressing range of the Model B and Master Series, right over the 640K limit of the IBM-PC, to one of 64 MB — over 1000 times as large. Even in the A440, with 4 MB of RAM, much of the space is empty. However, the organization is simple. The lower 32 MB contains the logical addresses, with which users (or their applications) deal. The upper 32 MB contains the physical addresses for system ROM, RAM, the

MEMC, the VIDC, and all the I/O devices — keyboard, filing systems, ports, and "podule" mounted extensions or add-ons. The MEMC holds a logical to physical address translation table, stored in a Content Addressable Memory (CAM). This is both very fast, and "soft" (ie programmable), and is found in many mainframe computers.

Video Controller — VIDC

The new machine has no fewer than 21 screen display modes. They fall into three groups:

- Modes 0 to 7 as for the Model B and Master Series, using from 20K for Mode 0 to 80K for Mode 7. This last is increased (from only 1K in the 8-bit modes) because Mode 7 is now "emulated", rather than using dedicated hardware (the Mullard Teletext chip).
- Modes 8 to 17, using up to 160K, and with 256 horizontal scan-lines, for use with a standard frequency linear monitor.
- Modes 18 to 20, using up to 160K, and with 512 horizontal scan-lines, which requires a "multi-sync" linear monitor. These are 512 line equivalents of modes 0, 8 and 12 respectively (see Figure 2).

Thus there are modes with 20, 40, 80 and now 132 columns for text, and 640 x 256 x 2, 4, 16 and even 256 colours for graphics. The 2, 4, and 16 colours may be chosen freely with 16 different levels of Red, Green, and Blue, from a "palette" of 4096. While the 16-colour modes default to 8 steady and 8 flashing for compatibility, they can be reset to any other combination.

In the 256 colour modes, 64 may be chosen freely via COLOUR, then 4 levels of "hue" or intensity, via TINT. Thus the available modes equal or better those of the Video Graphics Adaptor in the new IBM PS/2 range. Moreover, these screen modes are all non-interlaced, and hence free from flicker even with normal, short-persistence monitors (unlike the Amiga, in its 400-line modes).

However, just as Model B users made very little use of Modes 4, 5, and 6 (which were intended for Model A users), so with the new machines, attention will be concentrated on the new high-resolution, multi-colour modes. The remainder are provided mainly for compatibility with existing software.

Fig. 2

Mode	A SERIES		SCREEN	MODES		
	Text col x row	Resolution hor. x ver.	Logical Colours	Memory Used - K	Memory Allocated Others	- K 440
0	80 x 32	640 x 256	2	20	24	32
1	40 x 32	320 x 256	4	20	24	32
2	20 x 32	160 x 256	16	20	40	64
3	80 x 25	Text only	2	20	40	64
4	40 x 32	320 x 256	2	20	24	32
5	20 x 32	160 x 256	4	20	24	32
6	40 x 25	Text only	2	20	24	32
7	40 x 25	TELETEXT	16	80	80	96
8	80 x 32	640 x 256	4	40	40	64
9	40 x 32	320 x 256	16	40	40	64
10	20 x 32	160 x 256	256	40	40	64
11	80 x 25	Text only	4	40	40	64
12	80 x 32	640 x 256	16	80	80	96
13	40 x 32	320 x 256	256	80	80	96
14	80 x 25	Text only	16	80	80	96
15	80 x 32	640 x 256	256	160	160	160
16	132 x 32	Text only	16	132	136	160
17	132 x 25	Text only	16	132	136	160
18	80 x 32	640 x 512	2	40	40	64
19	80 x 32	640 x 512	4	80	80	96
20	80 x 32	640 x 512	16	160	160	160

Whereas some competitors (such as the IBM-PC) use dedicated video RAM, the A series use RAM interchangeably between video and main memory. This allows the user to decide (by choosing the screen mode) how best to divide the total resource (160K takes a big bite out of the 512K of the A305).

The screen modes available are limited also by the type of monitor. Modes 0 to 17 use a horizontal frequency of 15.625 kHz, which can be handled by a standard monitor, while Modes 18 to 20 use a horizontal frequency of 26.6 kHz, which requires a "multi-sync" monitor. (While a normal linear colour monitor costs less than £300, inc VAT, a "multi-sync" monitor costs around £600).

The Video Controller also looks after the sound. The sound synthesizer imitates up to eight different instruments playing at once, with mono or stereo output (from up to seven apparent positions from left to right). It can thus spread music etc across the "sound stage" — as with an orchestra. Up to four "parts" can be handled, eg soprano, alto, tenor, and base, or voice and keyboard (which is itself two parts — left and right hand), all plus one or two channels of percussion.

I/O Controller — IOC

This manages the Input/Output peripherals — such as the keyboard, floppy disc drives, Winchester hard discs, serial port, (parallel) printer port, Econet port, and external add-ons — either directly, or via their respective controllers.

Floppy discs

The new machines have a single 3.5 inch floppy disc drive as standard. As many users of the 8-bit machines can confirm, this is entirely practical, since the Operating

System and (Advanced) Disc Filing System are both in ROM. Moreover, in this case, the machine has so much RAM that copying with a single drive can be done with very little disc changing. (Indeed, most of the competitive machines are the same in these respects. Only the IBM-PC, where the Disc Operating System has to be loaded from disc each time, is hardly usable with only a single floppy drive — as some users of the Amstrad PC have found.) A second 3.5 inch floppy disc drive will be available as an option. As users of Master Compacts will already be aware, these drives are extremely quiet in action.

Of course, in adopting the 3.5 inch floppy disc, in its rigid plastic shell, Acorn are following not only their own lead with the Master Compact, but also that of all their competitors (including IBM, first with the Portable, and now with the new PS/2 range). As well as being robust, and of handy "shirt pocket" size, it offers a capacity of up to 800K — twice that of double-sided, 80-track discs using the original DFS, and 25 per cent more than those using the ADFS.

This may seem a lot in terms of an 8-bit machine, with less than 32K of RAM, but it is not if you have 1 MB or more. This is why a Winchester hard disc of 20 MB is an option (or standard in the A440).

Econet

As with the Master Series, the socket is already fitted, but the same plug-in board must be added.

The Acorn Bus

Expansion on the 300 series is via a "backplane", which is plugged into the motherboard, carrying 64-pin sockets for up to two "podules" (or peripheral modules), based on standard Eurocards. These are linked with the IOC via an 8-bit bus. One

such "podule" will be a board with 6 x 32-pin sockets for ROMs of 16 to 128K — for a maximum total of 768K. In an echo of the "serial" ROMs of the Acorn speech system, these are loaded into RAM for execution. However, this makes a lot of sense, in that at least the first generation of ROMs will be 8-bit ROMs which are suitable (such as View).

Even later products may require less than the 4 x 16K minimum which would be required if a 32-bit bus was used, eg to enable running directly from ROM. Furthermore, programs execute faster from RAM than from ROM or EPROM. (This is shown by the respective times for the BASIC benchmarks.) (See Figure 3.)

There will also be a "BBC" I/O podule, providing a User Port, 1 MHz bus, and A/D (eg joystick) connectors. This is mainly to allow the use of alternative input devices, such as the Concept keyboard, and for the control of robots and turtles. It is not possible to run an Acorn-compatible Winchester connected to such a 1 MHz bus, since the system software does not support it. However, Acorn will also offer (for the 300 series) a "podule" carrying the support circuitry for a Winchester hard disc drive, and a 20 MB drive that can be mounted internally, alongside the first 3.5 inch floppy drive. Moreover, the system software already supports such a drive.

The 400 series have an enhanced backplane, with provision for up to four "podules". Moreover, it supports a full 32-bit bus (with 96 pins), which allows special co-processors to be fitted. The ARM is designed to accept such co-processors, and Acorn plan to offer a hardware Floating Point Unit. This enhanced backplane is comparable with the Apple Nubus on the Mac II, and the Micro Channel on the IBM PS/2 Models 50, 60, 70, and 80.

Software

System Software

This comprises the extended Machine Operating System (MOS) and the improved Advanced Disc Filing System (ADFS). Both are held in the System ROM. It can of course use all the RAM that the machine can contain. In this it differs from the newly announced IBM PS/2 machines, for which MS-DOS 3.3 can still use only 640K of RAM directly (ie except as RAM disc).

The Operating System is not multi-tasking, but the machine is capable of "context switching", which is extremely rapid with the ARM. The distinction is that with multi-tasking, each task is a separate application program, and is allocated a time-slice, whereas with "context switching", any task can monopolise the processor. The Desktop (see below) can be used to illustrate the point. Although the clock is normally

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A C O R N R I S C M A C H I N E

Fig. 3

Machine	Language	Digits	Size - K	PERFORMANCE		COMPARISON		Interpreted		Basic		Store floppy	Store hard
				Times	in seconds	Intmath	Realmath	Triglog	Textscrn	Grafscrn			
Model B,	Basic I	9	24.75	-	-	2.6	5.8	76.4	13.7	21.5	24.3	-	-
DFS 80 tr	Basic II	9	24.75	-	14.6	2.6	5.8	80.6	13.7	21.5	24.3	-	-
Master 128,													
ADFS 80 tr	Basic IV	9	28.5	-	9.3	2.5	4.3	43.0	19.8	22.0	38.6	-	-
Master 512,	BBC Basic	9	64	35.5	3.9	1.52	1.92	11.02	61.3	13.8	27.0	21	-
DOS 800 K	GW Basic	7	60.8	57	4.7	1.7	2.1	15.3	23.0	-	8.0	4.5	-
ACCP,	Bas32f	15	993	46.1	2.9	1.07	1.4	3.14	13.0	12.5	37.2	-	-
DFS 80 tr	Bas32	9	995	57.5	5.4	1.08	1.83	12.21	13.0	12.5	37.2	-	-
A 305,	Bas V, RAM	9	306	8.45	0.55	0.21	0.25	1.00	3.36	6.53	6.58	-	-
ADFS 800 K	Bas V, ROM	9	370	11.3	0.76	0.27	0.37	1.37	3.53	6.9	6.78	-	-
Amiga 2000	AmigaBasic	7		66	5.92	1.7	2.7	6.7	150.3	25.0		16.2	
Atari ST	ST Basic	7		85	7.64	1.5	3.5	7.9	44.8	92.7	56.0	9.9	
Mac Plus	M Basic 1.	7		125									
IBM-PC	Basica	7	60.8	191	16.9	6.2	8.2	47.0	100	49.0		17.2	
IBM-PS 30	Basica	7	60.8		6.62	2.6	3.4	25.4	36.3	14.2	13.6	8.1	
RM Nimbus	GW Basic	7	60.8		6.45								
IBM-PC AT(6)	Basica	7	60.8	80	6.9	1.01	1.89	4.18	25.4	-		0.93	
IBM-PC AT(8)	Basica	7	60.8	61									
IBM-PS 50	IBM Basic	7	60.8		3.38	1.45	2.04	12.5	27.9	7.93	10.7	4.84	
RM VX 386	GW Basic	7	60.8			0.89	1.05	8.09	35.9	4.85		2.58	
Compaq 386	GW Basic	7	60.8	23	2.06	1.0	0.96	3.85	25.5	4.8		2.6	
IBM-PS 80(16)	IBM Basic	7	60.8			1.83							

Some results from Byte, Personal Computer World, and Practical Computing

updated continuously, when you do something intensive like scrolling a window, it stops temporarily, and catches up later. Although the Desktop (and other applications using the Window Manager) can give the illusion of multi-tasking, the multiple windows in fact look onto a single task (which contains several elements — OS window, calculator, clock etc).

The RAM may be allocated between several functions, including the Screen, Relocatable Module Area (RMA), Fonts (which occupy part of the RMA, and only when a font module is loaded), System (workspace), RAM "discs", and Sprites — with the application having the rest. The units are "pages" — the size of which depends on the total RAM, being 8K in the 512K and 1 MB models, and 32K in the 4 MB machine. Switching on with the R key depressed will "reset" to the default allocations. As shown by *STATUS, these are "0", 2, (6), 0, 0, and 1. However, a ScreenSize of "0" signifies "as appropriate for RAM size", and is 10 "pages" (ie 80K for a 512K machine) — enough for modes 0 to 14.

Relocatable Modules are the equivalent of Sideways ROMs (and ROM images) in the 8-bit machines. They may either be built-in (as in the System ROM) or loaded from "podule" ROMs or disc, and will take RAM automatically. One difference is that they are not limited in size (ie the space is not defined in "pages" of 16K). Moreover, each may also claim workspace on initialization. This could be reduced by *UNPLUGging eg the percussion voices, or the whole sound system. As with *ROMS in the Master Series, *MODULES brings up a list which shows the position (address), the workspace, and the name for each.

Text can be displayed on screen in various fonts and sizes, under the control of

the Font Manager. (see below). Such fonts are loaded from disc, but are also cached (buffered) in RAM. The FontSize is ineffective until one or more fonts are loaded.

RAM "discs" will be treated as an additional filing system, rather than as additional drives. The code for this will be available later.

The Operating System supports "sprites", which also require RAM. They can draw 1 Mbyte of data per second. This corresponds to a complete Mode 0 (640 x 256 x 2 colours) screen of 20K, in 1/50th of a second — ie at 8 million pixels a second. While this is much slower than handling a ready-formatted picture by "blitting", sprites can do "bit-wise" operations eg moving the picture one pixel at a time, "unpacking" the colour as necessary. Acorn claim that these two features match a hardware "blitter", while being much easier to use.

After the default allocations, a 305 machine has some 254K available in ROM BASIC (and is not limited to 64K or less, as in many other machines). Moreover, by setting the ScreenSize allocation to 3 (ie 24K) — enough for modes 0, 1, 4, 5, and 6 — and the rest to zero, and *UNPLUGging the Window Manager and the complete sound system, this may be increased to some 370K. If RAM BASIC (which is faster, see below) is loaded, these will be reduced by 64K. Conversely, a 1 MB machine has about 512K more, and a 4 MB machine, about 3.5 MB more!

ADFS

The new machines are able to read and write discs in the ADFS 640K format used by the Master Compact (and — on 5.25 inch discs — by the Master 128 and suitably-equipped Model Bs). These have a sector size of 256 bytes. In addition, a new ADFS format of

800K has been devised, which offers very significant advantages. As well as more storage capacity on discs of the same quality, it offers much faster data transfer rates, by using a sector size of 1K. For example, the new PCW "Store" benchmark takes about 19 seconds with the 640K format, but only 6.5 s with the 800K format — nearly four times as fast, as might be expected from sectors four times as large. Also, catalogue, load, and save operations are subjectively far faster than with the 8-bit ADFS.

The new implementation of the ADFS, and the new disc drives, enable discs to be catalogued immediately (as for the DFS, and for MS-DOS), without first having to *MOUNT them. (You should never see "Bad FS Map" again!) Indeed, the new ADFS software is even cleverer, in that it can recognize discs by name, and can prompt you for a given disc. ("Names" apply to the whole disc, and are distinct from "titles", which are local to a directory). Moreover, the ADFS now "caches" directory catalogues, and can recall them (and match them up) when the disc is swapped back again.

Another improvement to the ADFS is that files written by the new machine are automatically stamped with a type code, and with the time and date. The types may include eg Utilities, BASIC programs, data, and (executable) absolute code. This works for both 640K and 800K discs, and in such a way that the former are still acceptable to an 8-bit machine. As well as the filenames, the attributes, types, times, and dates, may be revealed by *EX.

Window Manager

This is the Acorn WIMP (Windows, Icons, Menus, Pointer) user interface. In pre-production machines, it is loaded into RAM from disc, but it will be included in ROM

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(expanded from 256 to 512K) on production machines. It is very similar to those of the Apple Macintosh, the Commodore Amiga, Digital Research GEM (used on the Atari ST) and Microsoft Windows on the IBM-PC. However, where most of these use pull-down text menus for primary selection, the Acorn WIMP uses a line of icons across the bottom of the screen, much as Microsoft Windows.

For example, the Desktop main menu consists of filing systems (eg floppy, hard, and network file server), shown on the left, and applications, shown on the right. Sub-menu lists may be "popped-up", even in the middle of the screen, by pressing the middle button on the mouse. However, this only responds if the pointer is on an icon, or in a window where a choice is available. A right-pointing arrow alongside a sub-menu option means that a sub-sub-menu is available. To activate it, you do not need to "click", but just move the pointer in that direction. Moreover, unlike Microsoft Windows, which allows only "tiled" (side-by-side) windows, the Acorn Window Manager permits overlapping windows.

Furthermore, after selecting, any window can be used, even when partially obscured! However, to avoid this, a new feature (and icon) has been provided. This is positioned next to the "close window" icon, and shows one rectangle partly obscuring another. "Clicking" on it causes the topmost window to be pushed to the bottom.

Font Manager

This too will be in the System ROM in production machines. It enables text to be displayed on screen in various fonts, at a range of point sizes, with the help of anti-aliasing to reduce the "jaggies" caused by finite pixel size. The text is also proportionally spaced, but can still be right-justified. The Operating System cannot use such "fancy fonts", but the default font can still be re-programmed (as in the 8-bit machines), using VDU 23.

The Desktop

This is actually an application (as for GEM) which makes extensive use of the Window

Manager, and will also be in ROM in the production machines. As well as handling filing systems and applications, it includes a Control Panel, complete with a facility for setting the colour palette for each of the logical colours. This is done by means of the usual three sliders for Red, Green, and Blue. A calculator, a clock, a notepad, and a diary are also provided.

BBC BASIC

This has now reached version number 5, but it is still very definitely BBC BASIC. Programs still have line numbers, but these can now be up to 65279, instead of 32768. In addition, there are several more constructs, including IF — ENDIF, WHILE — ENDWHILE, and CASE — ENDCASE. In all, where there were 121 keywords, there are now 159. It is also much larger, at some 55K (for the ROM version).

The rules for compatibility of BBC BASIC programs for running on the A Series are few, of which the most important is that they must not include any 6502 assembler (but see below). Since they run very much faster (about 25 times, in the case of a Model B), timing loops may need to be modified.

BBC BASIC V is available in two forms. It is included in the System ROM, and is available at switch-on, from where it may be run directly. However, in this machine, RAM can be accessed much faster than ROM. Hence, BASIC V is also supplied on the Welcome disc, for loading into RAM. The corresponding speeds for various benchmarks are shown in Figure 3. (Processor-intensive tasks run about 40 percent faster in RAM than in ROM.) The opportunity has been taken to include more "help", so it is some 8K larger than the ROM version.

6502 Emulator

This allows the A series machines to run BBC BASIC programs which include 6502 Assembler, and service and language packages which are written wholly in 6502 machine code. Again there are rules which must be satisfied for programs to work. They are similar to those for "tube" compatibility. Hence, if a program will run on a 6502

Second Processor, it will probably run under this emulator. The interface between the user and the OS has, as far as possible, been made compatible with that of the 6502-based machines, and the extra "op-codes" of the 65C02 are also supported. The speed corresponds to that of a 6502 running at about 1.2 MHz (compared with 2.0 for a Model B or Master).

However, the subjective impression is much better than this suggests, because the screen update is notably fast. This is because, in order to be fast enough with the new screen modes (using up to 160K), it is automatically very fast for the "old" screen modes, (using eg 20K).

A "Floating Point Emulator" is included on the Welcome Disc, for loading into RAM as a "Relocatable Module". This supports calculations with both "single" (4 byte/7 digit) and full IEEE 8-byte/15-digit "double" precision, in the absence of a hardware Floating Point Unit. However, it is not used by BBC BASIC V, which still offers 5-byte/9-digit precision, and uses its own floating point routines.

Bundled applications

The descriptions which follow are mere sketches, based on very brief acquaintance, for which I apologise to the authors concerned. Each is a substantial application by any standard, and merits much fuller coverage in the future. Three tutorials are supplied, on the Keyboard, the Screen Modes, and on ADFS, as for the Master Series. However, they have been completely re-written by Jonathan Griffith (under contract to Acorn). Still in BASIC, they do a splendid job of showing some of the outstanding features of the new machine. Three applications have been written by programmers under contract to Ashdown Software — Font Designer, Paint, and Music. They all use the Acorn Window Manager (WIMP) interface to great effect.

Font designer

This is a very powerful program, and uses the Metafont approach, defined by Donald Knuth. It has been written by Andrew Bray (of Advanced User Guide fame), entirely in BASIC. Both the program, and the results it produces, are excellent demonstrations of the power of the new machine. It enables almost any conceivable typeface to be designed consistently throughout the whole set (ie alphabet, numerals, punctuation marks etc), together with emphasized styles (bold, light, underline, italic etc) with remarkable speed, for displaying on screen. If it was offered on the IBM-PC, it could command a price of hundreds of pounds.

Acorn hope to include ready-made fonts similar to Times Roman, Times Italic, and Helvetica Medium — although they will have other names, as these are subject to copyright. The A Series machines can then

Fig. 4

Spec.	A SERIES PRICES (EX VAT)				and AVAILABILITY		
	No mon. 1 floppy	Mono 1 floppy	Colour 1 floppy	Second floppy	20 MB Winch.	Colour 1 floppy 1 Winch.	Available from
305	£ 799	£ 849	£ 999	+ £ 125	+ £ 499	£ 1498	Jun/Sep. 87
310	£ 875	£ 925	£ 1075	+ £ 125	+ £ 499	£ 1574	Jun/Sep. 87
410 *	£ 1399	£ 1449	£ 1599	+ £ 125	+ £ 449	£ 2048	1st qtr 88
440 *	£ 2299	£ 2349	£ 2499	NA	Std.	£ 2499	Nov. 87

(* 400 Series prices provisional)

305 to 310	RAM Upgrade	£ 89
300 Series	2-slot Backplane	£ 25
400 Series	4-slot Backplane	Std.

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A C O R N A R C H I M E D E S

Fig. 5 COMPARISON OF SPEED, FEATURES AND PRICES (EX VAT)

Make Model	Acorn A300	Acorn A400	Atari Mega ST	Commodore Amiga 2000	Apple Macintosh SE	Apple Mac II	IBM PS/2 30	IBM PS/2 50
Old PCW av. - s	0.55	0.55	7.64	5.92			6.62	3.38
Processor	ARM	ARM	68000	68000	68000	68020	8086	80286
Std ROM - K	512	512	256	256	256	256	128	128
Std RAM - K	512	1024	2048	1024	1024	1024 + 256	640	1024
Max RAM - K	1024	4096	4096	9216	4096	8192 + 1024	640	1024
Keyboard keys	103	103	94	94	81/105	81/105	101	101
Mouse - std	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Screen - (non-interlaced) x 16 cols.	640 x 512	640 x 512	640 x 400	640 x 200	512 x 342	640 x 480	640 x 480	640 x 480
Blitter function	Yes	Yes	Yes	Yes	Mono	x 16/256 co	x 2 cols.	x 16 cols.
Sound channels	8	8	3 + noise	4 waveforms	4	4 waveforms	1	Option
Floppy cap. - K	640/800	640/800	360/720	720/880	400/800	400/800	720	720/1440
Expansion bus	8-bit	8/32-bit	16-bit	8/16-bit	32-bit	32-bit	8-bit	16-bit
Slots free	2	4	1	5 + 4	1	6	3	3
Std RAM, no mon.								
1 floppy drive	£ 799	£ 1399	£ 869 ?	£ 1095		£ 3500 ?	-	-
2 floppy drives	£ 924	£ 1524			£ 2400		£ 1355	-
1 floppy, 1 hard	£ 1298	£ 1848			£ 3195	£ 4500 ?	£ 1808	£ 3092
Mono Monitor	+ £ 50	+ £ 50	Incl. ?		Incl.		£ 201	£ 201
Colour Monitor	+ £ 200	+ £ 200	£ 347 ?	£ 300	-	Incl. ?	£ 505	£ 505

use, in any application, any such "fancy" or "named" font for which a font file is held.

Paint

This program is also written entirely in BBC BASIC, by Hugh Douglas-Smith (who wrote the MUROM). On this machine, the improvement is not so much in the actual features, most of which have been provided before (eg in Timpaint, bundled with the Master Series), but in the greatly increased screen resolution (up to 640 x 256), and the number of colours available. These can be any 16 out of 4096, plus four Extended Colour Fill patterns.

Music

Also written entirely in BBC BASIC, by Crosbie Fitch, this program does as expected, by allowing you to write music on a conventional staff, and then to edit it and play it. What is different from eg the Music System is that you can write the parts for up to eight different "voices" (or instruments), and then play them all at once, in synchronism.

Game

This program — "Lander" — was written by David Braben (of Elite fame), wholly in ARM assembler. Not surprisingly, it features a spaceship (or "Lander"), moving over a three-dimensional land- (and sea-)scape, and subject to attack from missiles. The "Lander" is drawn with hidden-line removal, to look solid, and the missiles splash in the sea, but explode colourfully on hitting the land. The multi-coloured landscape has a "patchwork quilt" appearance, which is drawn in real time.

Non-bundled software

Despite being all-new machines, there is already software to run on them, and the promise of much more to come. Firstly, existing programs written in BBC BASIC (within the rules) will run — and very much faster. Secondly, programs written for the 8-bit machines, consisting of, or including 6502 Assembler, may be run on the 6502 Emulator. The main requirements are the same as for Tube compatibility (including not writing directly to the screen). Several of the View family will run already, and Wordwise, Inter-Word, Inter-Sheet, and Inter-Chart are being converted. However, they will all still behave as 8-bit programs, with small document sizes (save as provided for by View CP and Inter-Word MF). Thirdly, the Operating System (MOS and ADFS) is very similar to those of the 8-bit machines, and the Assembler is appears familiar to users of 6502 Assembler.

Also, the compatibility extends to graphics, which retain the same internal co-ordinate system (of 1280 x 1024) independent of screen mode, and the new screen modes again allow very easy scaling. Hence the learning curve for programmers writing new products for the 32-bit machines should be short.

PC Emulator

A program has been written which emulates an 8088 computer, similar to the IBM-PC, complete with the IBM keyboard and the Colour Graphics Adaptor. This will run MS-DOS, of which version 3.x supports both the 360K format used for 5.25 inch discs, and the 720K format used for 3.5 inch discs (as on the IBM Portable, and the new PS/2 range). The brief demonstration I saw was most impressive.

It was even able to run applications which look directly at the "scancodes" of the IBM keyboard (which the 80186 co-processor cannot run). Moreover, it could display in not just two but also in four colours (which again the 80186 cannot). With this level of emulation, it is hardly surprising that the speed is equivalent to that of a IBM-PC at about 2 MHz (instead of 4.77). It should be available (at modest extra cost) in September. Acorn expect to offer later a 5.25 inch floppy disc drive, and later still a "PC module", which will run much faster than the software emulator. These all afford access to the largest software base in the world, with over 10,000 commercially marketed packages.

Documentation

I saw early versions of the Welcome Guide booklet, and a very substantial User Guide (of some 370 pages), which will accompany the machines. Also available is a Programmer's Reference Guide (of some 280 pages), and separate Datasheets (booklets) on the ARM, MEMC, VIDC, and IOC chips.

Performance benchmarks

The performance of the A Series and other micro-computers, when using interpreted BASIC, is shown in Figure 3. The results include the "Byte" Sieve test, and the old and new Personal Computer World benchmarks. They show that the new A series represents a remarkable advance, not only over all previous Acorn machines, but also all three 68000 machines, and the 80x86 machines, including the latest 386 models. Certainly, on these measures, it can claim to be "the fastest micro in the world" — and by a factor of three or four!

Prices and availability

These are shown in Figure 4. The prices for the 300 Series are firm, since they will already be available by the time you read this. Initially, the quantities will be limited (but still thousands). It is expected that they will be much in demand by suppliers of software and hardware, by large organizations for evaluation, (and by reviewers!). Larger quantities will be available from September, along with the first hardware additions.

The prices for the 400 Series are provisional, since the A440 will not be available until November, and the A410 until the first quarter of next year. However, they are probably firmer than those of the Atari Mega STs and the Apple Mac IIs, which have been announced but are not yet available in the UK, and — as imports — will be subject to exchange rate changes.

Feature and price comparisons

A comparison of the new Acorn machines with some major competitors is shown in Figure 5. The first thing to note is that they are up to 10 times as fast on the old PCW benchmark — which is a rough indication of processing speed. When weighing memory, ROM is at least as valuable as RAM, since it more convenient to have the Operating System etc. there at switch-on, rather

than loading it from disc. Even assuming that this can use all the RAM in the machine, the amount which is useful is related to speed — both of processing and of the filing systems.

The Acorn screen displays are only approached by machines which are much more expensive, and only bettered by spending even more, while the sound systems are certainly comparable. The scope for expansion is considerable, as befits machines with a long future ahead of them. In this context, it is apparent that the prices are highly competitive, and are convincing proof of the sheer excellence of the design. Manufacture in the UK, using the most modern plant, must also contribute.

The other machines may have larger software bases, though that of the A Series is already considerable — thanks to the various emulators. However, the UK is recognized as excelling in software, and now has a world-class machine to write for.

Conclusions

The new Acorn A series could be described as “the European Option” — offering alternatives to the Atari ST, Amiga, Macintosh or IBM PS/2 ranges, which are all American in design, if not in manufacture.

The hardware is most impressive. It is smart in appearance, and also brilliantly

value-engineered. There are no signs of cheese-paring, but there is not an ounce of fat on it. This of course reflects the design philosophy of the ARM processor chip inside. The system software is equally excellent, and the whole promises to be the vehicle for outstanding application software, and computer-based systems. The speed is quite exceptional, compared with even the latest American machines, and regardless of price — being three or four times that of the 386 machines from RML, Compaq, and IBM. Yet even the A305 offers more usable memory (ROM and RAM) than any PC, and also an Operating System in ROM that can use all of it directly.

Clearly these are the world-class machines that Acorn was destined to build. With these specifications and performance, the support of the BBC and Olivetti, and a name like Archimedes, they stand an excellent chance of “displacing” others from the market!

This preview is necessarily incomplete. I expect to give more information about the memory usage, performance, software availability, and hardware add-ons as part of a full review in the next issue, after I get my hands on a machine for a longer period.

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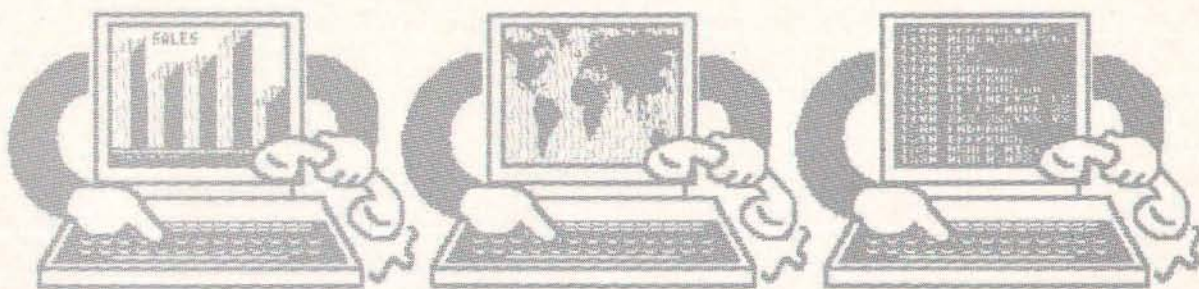
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STARTLINE

Communicating with your micro is easier and cheaper than ever before. At the same time, on-line services are becoming more plentiful and less specialised. This issue, we will dial up the nuts and bolts of computer communications.

It is not vital to know all the technicalities of on-line data transmission but the terms used and explained here crop up everywhere computer communications are discussed. If you dial a bulletin board, you are bound to find messages from others wanting help from the more experienced. Knowing a bit about it is bound to help with understanding the answers. And bound to tickle the curiosity. Enough of the sermon, on with the explanation.

The legendary RS423

The BBC micro has a built-in communications interface — the RS423 socket in between the cassette and RGB ports. But a little more than a socket is necessary. If two BBC Micros are put side by side they can talk to each other by means of a lead plugged into the back of each machine's RS423 serial interface. Try issuing operating system call ***FX 3,5** on the output machine, select transmission speed with ***FX 8,n** and all output to the screen will also go to the RS423 and thence to the other micro. Do the same with ***FX 2,1** and ***FX 7,n** on the receiving micro and they are communicating. Files and programs can then be passed between them. But doing the same with remote computers is a bit more of a problem.

Jargon word: **serial interface**. Internally, the computer transfers data 8 bits at a time, in parallel with each other (8 bits equal one byte). The PSTN (Public Switched Telephone Network) has only two wires so information has to go through one bit at a time, like cars on an eight lane motorway going through a single lane roadworks. The serial interface is the point where the road narrows. Even if the PSTN did have 8 wires, data inevitably travels at slightly different speeds down different

Connecting up to the real world — and how the data is transmitted

wires. This is 'data skew' — the bits arrive at slightly different times. Simple parallel lines are unsuitable for long distance transmission.

Without a dedicated, amplified and very long RS423 lead, the only convenient channel for information is the PSTN. Not only does it connect 80% of households and every business establishment but it has the amplifiers to compensate for signal strength losses due to cable resistance. So a very long RS423 lead would be no good anyway, due to loss of signal!

So the PSTN is the channel to use — the world down a wire. But we need to send signals in a manner the PSTN can cope with — connecting a micro directly to it is not to be advised.

The Hard...

Have you ever dialled a BT music service? If so, you will have noticed the poor quality, even compared to the most modest stereo system. When first conceived, the PSTN was not meant to carry any signal other than speech, which consists of analogue waves conveying little information at the far ends of the frequency spectrum. So its frequency response, at 300Hz-3kHz, is just about good enough for that. Most of the time, we can understand the person on the other end even though a significant proportion of the information (speech)

they are sending has been lost. We, being intelligent, can infer what the missing information is.

But computer signals are hard-edged digital waves. And computers, being basically stupid, cannot infer missing information. Anyone who has ever had a disc or tape error — and that's most of us — knows what I mean. The consequence is that, were you to plug the RS423 output directly into the phone socket, the receiving machine would be lucky to understand a single bit. Not to mention the fact that the PSTN carries about 50 volts and would certainly destroy the serial interface chip, which uses 5 volts, if nothing else!

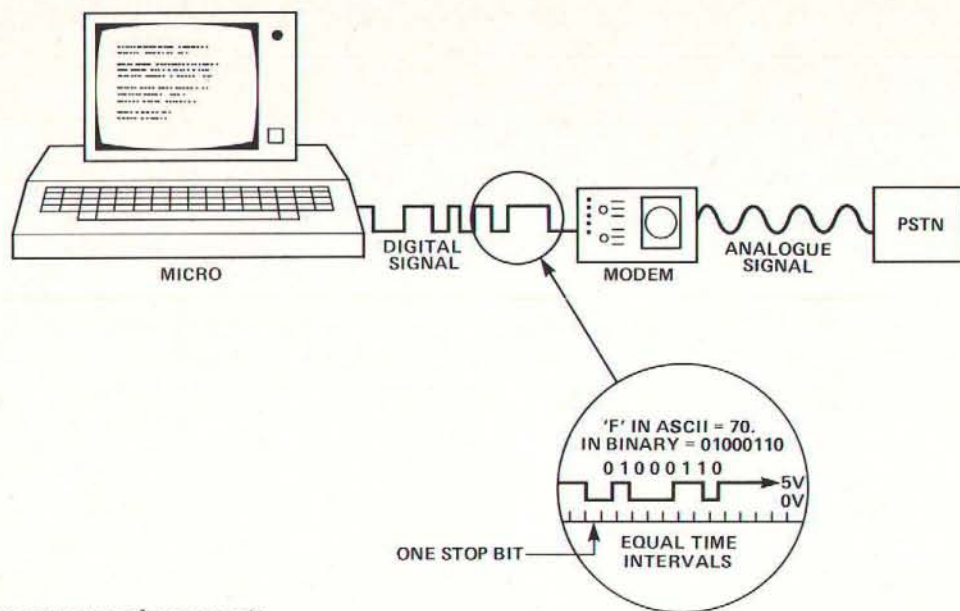
Jargon: **analogue and digital**. Analogue means a direct representation of the original in this case, speech sent as an electrical audio signal, continuous but varying. Digital means a series of on-off pulses, like Morse code. It is the language computers use internally.

So we need a device between the machine and the PSTN to do two things. Firstly it must turn the micro's signals into electrical analogues of sound waves that the PSTN can cope with and vice versa. Secondly, it must make sure the PSTN voltages do not get into the micro. That is what a modem's basic function is. Some do all sorts of other trickery as well, which I will go into next time.

...and the Soft

So, you have the computer and the modem but, without software, it can do little. Software is the key to unlock all that waiting information. Fortunately for us BBC users, programs are still being written and, in general, they are getting better as the machine matures. By getting better, I mean they offer more facilities and squeeze more power out of the BBC micro than anyone would have thought five years ago. I will be looking at added features later in the series. But all the program needs to do is make sure the two machines are communicating at the same speed and that they

COMMS : STARTING OUT



Behind the scenes as your modem connects

are talking the same 'language'. That may not be as simple as it sounds.

Fortunately there are standard speeds for transmission and reception. Look at page 424 of the BBC B User Guide. There, under *FX7 and *FX8, are the data transmission and reception speeds the machine can deal with.

Bits and Pieces...

The first communications experience most beginners will have is logging on to a bulletin board. That is because they are free, apart from the normal phone charges. (Technical bit coming up.) Boards almost all operate at 300 bits per second for incoming and outgoing data. Three hundred bits per second is equivalent for all practical purposes to 300 baud. Many boards (sounds the same as baud!) also use 1200 baud for their transmissions and 75 baud for reception. Check page 424 again and there are those same speeds. We have agreement!

Jargon word: **baud**. Means pulses per second. Comes from the name of the Victorian French inventor, Baudot.

Jargon word: **bulletin board**. Means a computer set up to act as an electronic notice board. Access is usually free.

Jargon word: **logging on**. Means entering a communication system such as a bulletin board and going through the procedures that tell the system who you are. "Logging off" is leaving the system in an orderly way, not just dropping the line.

It does not pay to worry about exactly what the speeds represent. The numbers do, though, represent a linear ratio between them: 2400 baud is twice as fast as 1200 baud, and so on. The point is that the machinery must be told at what speed to transmit and receive. Some software packages can do this automatically but most do not. In practice, as I have already suggested, there are only one or two speeds most need worry about. But we also

need to know what protocols to use. This is the 'language' part. Protocols?

...stopping and starting

The end of my colleague Dave Somers' *On Line* column always includes the information about bulletin boards operating with an 8 bit data word, no parity and 1 stop bit. Here is the chance to find out what that means.

Think of a delicate, international diplomatic meeting. The fate of millions hangs on how well the representatives get on together. Nothing must stand in the way of that, nothing untoward must upset them. So there is a place for everyone at the dinner table and an order in which they shall speak, according to status. Otherwise, they will never talk to each other again.

Communication using a BBC micro may not be quite as portentous but getting the protocols right is crucial. Sending bits of information down the phone is a fairly simple concept until you ask how the receiving computer distinguishes between one chunk of data and the next. If the bits are simply transmitted one by one, each eight bits representing one character, how does the receiver know where one byte stops and the next starts? So there are standards — several, I am afraid but again, most bulletin boards adhere to one or, at most, two of them.

Have a look at the diagram. You will probably know from the User Guide that ASCII code 70 represents the letter "F". In binary it is 0100 0110. When transmitting, as the diagram shows, zero is represented by 0 volts and 1 by +5 volts. But there is an additional bit on the left telling the receiving micro where the end of the character is — where it stops. So it known as a stop bit. Now for the last bit — parity.

Parity comes in three flavours: even, odd or none. It is a simple code designed to check that no errors have crept in during transmission. Assume we are talking about even parity. Add up the number of ones in the binary version of the letter "F" and you get three — an odd number. The sender would add another "1" to the pulse train to bring the total number of ones to an even number. If the letter were "G", having an even number of ones, the sending computer would add a "0", to ensure that the number of ones always added up to an even number. And vice versa for odd parity. If a bit had been lost or switched during the journey, the receiver would know. With no parity, as you would expect, there are no parity bits added.

As long as both computers are agreed on the protocol, they will communicate with no problems. In the example, as soon as the receiver gets nine bits, it knows to treat the first eight bits as data and the last one as a delimiter.

Jargon word: **ASCII**. Stands for American Standard Code for Information Interchange. It is one of the compatibility success stories in computing, as almost every computer round the world understands it. The number 70 for example, always represents the letter "F". And you thought ASCII codes were unique to the BBC Micro! See page 64 of the BBC B User Guide for further information.

There are other means of error-checking which are more certain. Parity bits alone will not guarantee every error is detected but they are good enough for most text files, where an odd character is easily spotted. They are not powerful enough a convention for binary files, such as programs, where a single bit lost can mean a whole program is useless.

I have gone on a bit about the technical side of things this month but this means that next time, I can go into a bit more depth about what is available to help you get on-line.

Until then, happy dialling!

KEYBOARD CAPERS

Since its very earliest days, the Music 500 synthesiser has always had the capability of driving a music keyboard. Even under the old cassette version of AMPLE (model BCE), the Music 500 was able to accept direct input from a prototype keyboard — then a 1MHz bus device that was plugged directly into the back of the Music 500.

After the Music 500 was dropped and a new, slightly changed Music 5000 became available, and a completely new version of the AMPLE programming language was released, this time on ROM, the Hybrid Music System really started getting going. With a new environment called Studio 5000 (AMPLE stands for Advanced Programming Language Environment) — I reviewed the Music 5000 hardware and Studio 5000 software back in January 1987, but at that point, the keyboard extensions were still undergoing changes in software and were not ready.

At last, Hybrid have released a keyboard for the Hybrid Music System called (strangely enough!) the Music 4000 keyboard. It is an extension to the environment, yet it is still part of the integrated studio, being driven by modified Studio 5000 software — and as we shall see later, it fits into the AMPLE design philosophy very well.

About Music 4000

The Music 4000 keyboard will be available as part of the complete Hybrid Music System, but for existing owners of the Music 5000 and of the Music 500 (with AMPLE nucleus ROM and upgrade pack), the keyboard and software will be available as a separate option.

The Music 4000 package consists of a polyphonic keyboard, a manual and a disc. The keyboard is quite extensive, spanning four octaves. It is ruggedly built out of metal with two plastic "wedges" at each end and has the usual feel of any synthesiser keyboard below £500. The keyboard unit connects to the user port of the BBC Micro and has a long length of ribbon cable for the job. Also included is a foot switch, used for sustaining notes until

At last! Music 5000's very own keyboard makes music easy to play



the pedal is released and for adding rests whilst in the Notepad or the Staff editor.

The Music 4000 keyboard bears more than a passing resemblance to the ATPL *Symphony* keyboard; indeed, any owners of the ATPL model will be pleased to know that it is completely compatible with the Studio 5000-4 software, as the differences between the two appear to be purely cosmetic. For *Symphony* owners, there is a software-only upgrade available (see Factfile at the end) at a considerable saving.

The disc is a completely new Studio 5000 disc with the extra software needed to read the keyboard. Called the Studio 5000-4 disc, it requires personalising in the usual manner

before use; this involves entering your own passcode number before using the software for the first time.

The manual is an extension to the Music 5000 manual; it makes reference to it throughout and is 38 pages long with occasional illustrations and plenty of examples. It is clearly printed and well written and complements the Music 5000 should you be approaching the Hybrid Music System for the first time.

Integration

One of the nicest features about the Studio 5000 is that it is an integrated software package, enabling users to sketch out and compose music, either in staff notation on the staff editor, or AMPLE notation, by using the Notepad. With these, and other parts of the Studio, you can jump in and out of modules (Notepad, Mixing Desk, Recorder and so on..) without having to manually save and reload files.

The Music 4000 keyboard integrates itself into the Hybrid Music System quite nicely by adding extra sections to the main menu. Regardless of where you are in the Studio 5000 software, you can play the keyboard at any time, either at the "%" prompt (AMPLE's equivalent of ") for BBC BASIC), or whilst you are running a module itself.

The Music 4000 keyboard is a polyphonic keyboard, allowing you to play up to eight different notes at any one time; it is therefore able to produce any combination of chords or multichords you care to play, depending on the complexity of the sound being produced by the synthesiser hardware.

On the disc is a large library of sounds for the Studio 5000 and all can be played via the keyboard. The success of a conventional music synthesiser is often based purely around the quality of the sounds it can produce, and not (as some people may argue) on the programmability of the synthesiser in question — for instance, the Yamaha DX-7 is probably the most difficult synthesiser to program I have

MUSIC 4000 KEYBOARD

seen in digital synthesisers, but the sounds supplied on the basic DX-7 ROM set are so good that few really bother programming their DX-7s at all.

By comparison, the Music 5000 synthesiser is child's play to program, and some of the best sounds yet produced for the hardware, have been supplied on the new disc. From the Music 5000's presets, you can write plenty of music without even having to think of generating a new sound, and very often, you simply have to modify a certain sound to create the instrument you are looking for — certainly you don't have to almost start from scratch every time, as is the case with the DX series.

The instrument names adhere to the standard recommended in the Music 5000 manual, whereby all instruments should be prefixed by a number — for instance, the sound "fatmoog4" automatically tells the user that the instrument requires four voices for a sound, (if it only uses one voice, then no numbering is required) but in the case of "fatmoog4" it is only possible to play a maximum of two notes at the same time. Most sounds only require the two channels that make up a voice — the most effective of which is the "upright" instrument, an excellent piano sound which is extremely lifelike, if played properly.

A set of general playing sounds are supplied on the system disc ready for you to play. To load them, you press (F9) (function key 9) and you are dropped into a menu called *Music 4000 Example Files*. This allows you to select either "general" or "special" sounds. You can record using a real time input system, or simply sit back and listen to some songs supplied on the disc ready to remix, modify or do whatever you like to them.

Playing the synthesiser simply as a "live" instrument is probably the first thing you will do with the system. All of the sounds created on the Music 5000 synthesiser can be played using the keyboard, and it is always nice to be able to use your own sounds generated from old songs.

The Music 5000 synthesiser as a keyboard instrument is actually very good; the keyboard is responsive, and has just enough spring in it to make playing a natural and comfortable affair without being so springy that some notes are lost during fast passages. There is a short — but perceptible — delay after a new sound is selected from a matrix of sound names on a Mode 7 screen, so you cannot immediately flip between sounds as is possible on most digital synthesisers, but with a second synthesiser, there is no reason why you shouldn't consider using the Music 4000 keyboard as a performance instrument, as opposed to simply using it as a playback or a compositional instrument as if it were just a jumped-up sequencer.

The sounds themselves are a mixture of old and new. Some sounds seemed to have been beefed up (although that may be my playing doing this), many are new, and most are useful in some musical context or another — which is a good sign as many preset sounds on other digital synthesisers are not worth the memory they take up.



Keyboard effects

On the performance side of the software, the instruments can be freely edited and renamed; so if you want a different sound to one of the preset ones supplied, you can access them without having to resort to the Notepad.

By using the (SHIFT) keys with either the (Left) or (Right) cursor keys, you can move around the different parameters to modify the operation of the keyboard. Using this panel you can alter the pitch transposition to play at semitones or complete octaves higher or lower. This is more useful than it sounds. For instance, setting TRANS to 1 will create a thirty-second tone scale whereas setting the TRANS level to -16 will reverse the pitch. Such an effect is known as an *inverted interval* and can be very useful if you happen to want to play variations around a popular song or change repetitious bar sequences.

The *Spread* control positions the voices in a stereo field and requires two numbers for the left and the right hand channel. -3,1 spreads from left to right, -3,2 spreads from left to right and back again, -3,6 will alternate between right and left channels (great for bass lines — an old Ultravox trick that) and so on...

Expand is a powerful mode that transforms each key press into a programmable pattern (built up of either an arpeggio, a chord or an echo pattern using any pitch or duration). Used in tandem with the foot switch, such patterns are very useful for programming in bars of music, or for simulating the old eight note sequence patterns favoured by bands such as Kraftwerk or Tangerine Dream.

Echo effectively turns the *expand* option into an echo unit, allowing the user to play a sequence of notes and having the note played back with a user defined echo backing it up. Again, this is great for bass lines, or for adding a little depth to an accompaniment — but you have to be careful with the amount of voices you are using with echo and it seems more effective with monophonic sounds or drum patterns.

As usual, the (TAB) key is used to toggle between the "%" prompt and the currently selected module. If you make a pig's ear of one of the supplied sounds, you can restore the instrument back to its former glory by typing "instrument"GET. The function keys are used for the main AMPLE system keywords, so GET can easily be called up by pressing (F1).

You can save new sounds by exiting the software and going into the main menu by pressing (F0) and calling up the SAVE program option.

If you are familiar with Notepad, then you will know that keyword panels can be stored as words just like instruments, and that you can add extra effects and sound controls including keyboard tunings using text mode. KEYB is the name of the initial panel and can be used as a command with the GET word.

You don't have to enter the Notepad via the keyboard panel in order to edit an instrument at the same time. You can either use the KEYB word just to set up the voices and then GET the instruments manually by typing "instrument"GET, or you can set the voices up by keyboard command sequence only — the latter will enable more direct control over sounds and keyboard performance, (monophonic, duophonic and so on), but the former has the advantage of being simple and easy to use.

After selecting an instrument on the keyboard panel, or via the KEYB word, you can switch to other modules — including the mixing desk — and adjust the parameters as normal. You can play the keyboard whilst in the mixing desk, but it is often better to switch to command mode for best results, as the keyboard can get a little sluggish in this mode.

Whilst in the mixing desk, you can set aside a separate track for yourself and "play along" with a piece of music, which is a very good way of learning to get around the keyboard quickly without having to formally take up piano or organ lessons (although if you are serious about an instrument, lessons would be a good move!)

A digital tape recorder

As you play the keyboard, information about which keys are being pressed is sent to the Music 5000 which is then converted into sounds. The Music 5000 software is capable of recording these notes, which are eventually transferred into AMPLE notation. However, the point of recording is not precise reproduction, but the natural entry of musical information which can then be processed, edited and rearranged, to build up a complete piece of music.

Recording is done mainly from the *Recorder Screen*, you can jump between the "%" prompt and the recorder simply enough, by pressing the (TAB) key. The initial menu has four options at the top — *Perform*, *Record*, *Play Original* and *Play Final*, as well as various settings for later stages of recording.

For simple recording you can select *Perform* — useful for entering simple pieces with the Beeb acting as a metronome for timekeeping (AMPLE uses the Beeb's internal speaker for the metronome action).

Initially the metronome is a guide for recording with a high beep for the end of each bar which means that a 4/4 piece of music will

C O N T I N U E S ►

have three low beeps and a high beep on the fourth, this can be altered to suit other time signatures.

To record a piece of music, you simply select the *Record* option and the metronome starts straight away with a two bar count-in so you should start on the third high beep. You can stop recording at any time by pressing the (Space Bar).

To replay the recording, select the *Play Original* option and again press the (Space Bar) when the music finishes. One nice point, is that if you make a mistake in the piece, you can press (RETURN) and start recording immediately. The last operation, *Play Final* also replays the recording, but this time any slight deviations in timing are corrected. The process is called *quantizing*, and is achieved by shifting each note and rest to the nearest small division of the beat (called a quantum), if you are a little late in the delivery of a certain note in a bar, the note will be shoved back to its original place. To listen to a piece of quantized music is not that different from the original as the quantum size is quite small. *Play Final* (after quantization) will return an indication of the number of bars recorded.

For recording, you can change the tempo of the recorder as well as select all sorts of instruments, and change them about after recording, as well as being able to alter the metronome volume — for instance, turning the metronome volume level to zero for playing back your recording.

Of course the recorded material can be stored as an AMPLE word, by typing MAKE at the "%" prompt (command mode). You can edit and examine the music on the Notepad or the Stave editor at any time — I have found that there is *always* something to be edited after it has been recorded, but that's probably because I'm a lousy piano player!

One final point is that the tempo settings are not transferred from the recorder to the other sections of the studio. The tempo can be independently altered on the mixing desk, or via a direct "=T" command, so even if you recorded a complicated tune at half speed, the tempo setting is done elsewhere.

Stringing it all together

If you have created a multi-part piece of music (this includes simple duos), then it is just a simple matter of stringing the words together as "part1" "part2" etc in the Notepad. The command RUM will play all of these together.

You can re-record a part at any time, by just setting "players" to the number of the part before recording. Until you enter MAKE, the old version will still remain in memory, should you need it, and it is always good to rename it to something else for future use, should something untoward happen to the newly made word.

Once a mix is created, it will automatically be used for backing parts played by the recorder so the re-recording session will have the advantage of using the final sounds. You

can use your choice of instruments from the start of recording, but if you are not happy with them, then it is a simple matter of replacing the instruments in the mixing desk.

To record a second part of music, you move the "player" number up to 2 and repeat. You will hear part one played back as part 2 is recorded. *Play Original* and *Play Final* also play the previous parts along with the new one, so you can repeat the process up to eight times, building up more and more tracks, although remember, a chord instrument will take up three or sometimes four voices.

After all the parts are recorded, you can set up mixes, either by loading standard mixes from disc, or by setting themselves up yourself from the desk. Drums are often the first instruments to be recorded in a conventional studio, but as the trend is moving more and more away from acoustic drums for many modern recordings, musicians and engineers often leave the programming of a drum unit until the end. I have found that this is also the case in the Studio 5000 software, very often you may wish to write a simple 4/4 beat for the time being (easily set up in the Notepad using the "X" word) and then finally programming a more complex pattern when the music starts to take shape.

The *quantum* setting is actually very useful for creating strange musical effects and for bringing notes and rests into strict alignment. One example of using the quantum setting creatively is by having a quantum setting used with a recorded pattern and made with a high quantum size which will mean that only a few notes will get through. After renaming the quantized part, you can try again at a different quantum level and so on.

After selecting some highly contrasting instruments, you can get amazing effects — very cyclic, and very very complex, whilst still retaining the original musical score.

Working with Music 4000

The Music 4000 keyboard is probably the best thing that has happened to the Music 5000, simply because it will enable a great deal of musically orientated people to use the Music 5000 synthesiser by giving them a means of input that they can relate to, it also expands the Music 5000's capabilities as a "real" synthesiser and not as a very complex sequencer or micro composer.

With the Studio 5000 software, programming is set at a minimum, making it possible for just about anybody to use the Music 5000/4000 combination without having to communicate with the computer beyond a few cursor presses and a press of the function keys.

The Music 4000 keyboard also improves the machine's capabilities as an educational tool, helping people to learn more about the mechanics of composition and songwriting, as well as supporting a more than adequate stave editor to show users what music looks like once it has been keyed in.

Sadly there isn't a Music 5000 compatible

Midi interface available yet, this precludes the synthesiser's serious use in studios or with other Midi equipment, and until this is done, we won't be able to easily synchronize the Music 5000 with other Midi instruments.

For the Music 5000 at home, users will be able to play along to records and songs, even replace the traditional home organ with a cheaper and more versatile instrument — the Music 5000 can create all the sounds a home organ can (at a cheaper price) but why stop there? You can have some very impressive string sounds, and the "upright" piano sound is very very good, I would put it roughly equivalent, if not higher in quality, to the sampled piano on the Ensoniq Mirage disc. For a synthesiser to produce a piano sound superior to a sampled original is very good going for even the best of the digital synthesisers from the big boys, which is interesting, because the "upright" sound, amongst others, has been on the Music 5000 ever since the Studio 5000 issue disc became available — a keyboard was all that was needed to make some of us realise how good it is.

The Music 4000 keyboard is initially an upgrade pack for existing Studio 5000 users although this is not simply an add-on, because the Music 4000 keyboard is actually part of the Hybrid Music System of integrated units, consisting of Music 5000, Music 4000, the software and at the root of it all, AMPLE Nucleus. The Music 4000 keyboard is well made, and is supported by excellent software; the keyboard is fast and responsive. The wait was well worth it!

Factfile

The Music 4000 keyboard and the Studio 5000-4 software upgrade costs £169 (inc) and is compatible with the BBC B, B+ and Master series computers.

For owners of the ATPL Symphony keyboard, the software-only *Symphony Upgrade Pack* costs £47 (inc) and works with all BBC series machines and both the Music 500 and the 5000.

Contact *Hybrid Technology Ltd, Unit 3, Robert Davies Court, Nuffield Road, Cambridge, CB4 1TP.*

Hear Music 5000 in action

If you want to hear Music 5000, you can still buy copies of my Music from Numbers demonstration tape of the expanded Music 5000 MIDI system with sound sampling and systems music, showing off layering techniques in MIDI with an early version of the AMPLE Nucleus ROM.

Recorded in a studio on high quality chrome tape and professionally mastered, the tape contains four tracks and costs just £1.99, which includes P&P. Make the cheques payable to Clive Grace and send them to AMPLE Tape offer, A&B Computing, 1 Golden Square, London W1R 3AB.

SOUNDING OUT

It's always good to hear about products after we've reviewed them. So often companies send us a product to review, and that's it, no more. Occasionally we tend to lose touch with these products (although we try not to) and as the computer industry is an on going thing, a creature of gradual change, so products get improved and the software gets rewritten, and slowly a product evolves with the changing demands of the market, but sometimes the original review bears little relevance to an upgraded product.

Since I reviewed an intriguing device called the *Barry Box* back in June 1986, a lot has happened to the world of sound sampling for the BBC Micro. The Powertran MCS-1 is no longer in production as Powertran have gone bust, thus leaving the Barry Box the dubious honour of being the only sound sampler available for the BBC Micro.

All ears

The Barry Box is quite a basic sampling unit and has few frills; it has a sideways ROM as its operating software, and has a supplied microphone suitable for capturing low quality samples and close up sounds.

The operating ROM (called the Barry ROM), also has a number of operating system commands built into it, which can all be accessed by any language with an operating system interface, so if you are a dab hand at programming in ISO Pascal or BCPL then you can quite happily write your applications with these languages — you could probably compile them into machine code with a bit of care as well!

So, what we have here is a basic, no frills sound sampler, with about two seconds of 8 bit sampling at its disposal.

Of course, all this may seem a little spartan in the light of new 16 bit samplers and the latest Pulse Code Modulation (PCM) data capture units with four times oversampling; by comparison, the Barry Box *is* spartan!, but

A revitalised sound sampler, with more features than ever

what do you want for the price... blood out of stone?

The changes to the original device since my last review are mainly in hardware, some changes have been made in the software, and more changes are promised for the future, but for now let's look at the new Barry ROM software.

Changes...Changes

After plugging in the sampler into the 1Mhz Bus, and booting up a few, much loved samples, I was immediately aware of the changes in the sample quality! I was always amazed that the Barry Box was able to produce such powerful sounds for such a small box, but since the initial release of the Barry Box, things have changed quite a lot, not only in sample quality.

For those of you who haven't read my original review I will recap on what the Barry Box actually does.

The Barry Box is a sound processor with which you can capture sounds and replay them at any pitch and at any number of speeds. This means that you can sample all sorts of everyday sounds (yes, even dogs barking and crashing glass... yawn) and you can, of course write music using these sounds, although the Barry Box isn't primarily a musical device.

The Barry Box plugs into the 1MHz bus socket and leaves the analogue and user ports

free for other applications — again, if you are willing to delve into the complexities of programming these hardware interfaces — you can connect all sorts of peripheral devices, such as music keyboards, joysticks, lightpens and so on, so you can control the Barry Box by some form of remote control, and no doubt we will soon see some applications using the Barry Box in conjunction with some of these devices in later versions of the system.

A short cable connects the Barry Box to the disc drive's power supply; a "through" lead is wired to the plug, allowing the disc drives and the sampler to be powered at the same time.

Such a connection does not cause *too* much of a drain, even with two disc drives and additional power drains such as sideways ROM boards and user port devices; and for those of you with Beeb's bristling with hardware, then you will still find the Barry Box's drain negligible. However, if you really want to, you can connect the Barry Box to a stabilized 5 volt power supply, resulting in a slightly improved performance in playback and sampling quality.

The Barry Box uses the BBC's internal loudspeaker for its sound output; however, this is very quiet and doesn't yield very good results. This is why the new Barry Box includes a sound output socket which can be plugged into any 200 Milliamp input. This is suitable for nearly every domestic and professional amplifier and is powerful enough to go into Tascam "PortaStudios", cassette decks, combo amplifiers and even studio mixing desks!

Once the sound has been stored (and I'll get onto that in a minute), the fun really begins! You can replay your sample either backwards or forwards, you can reproduce it in whole or in part at a variety of speeds, and it can be used to create all sorts of strange effects; the most popular of which is the

C O N T I N U E S ►

WAREHOUSE SOUNDSAMPLING

"MMMMax Headroom" stutter.

The Barry Box's creator has supplied me with an interesting BASIC program; this turns the Barry Box into a sort of echo unit, bouncing the sounds around very competently. I have used dedicated echo units that have produced output of a similar quality, and whilst the applications are purely entertaining for the time being, these routines will no doubt prove very useful for creating cross echo and rhythmic effects.

Samples can be stored on disc and on tape, and you can even dump them in sideways RAM. RAM storage is always useful if you want to download samples into the Barry Box very quickly. In addition, the Barry Box enables you to examine the waveform of any part of the recorded sample. This can be displayed on the screen and may also be broken down into its constituent frequency components, thus allowing you to measure the frequency of the recorded note. These waveforms can be dumped to a printer via an Epson screen dump program.

The two modes of operation still remain unchanged since the Barry Box's earlier release. These two modes are "direct mode", allowing the user to operate from the menus in the Barry ROM, and "program mode", allowing you to control the samples and the Barry Box from a programming language like BASIC or ISO-Pascal.

Unfortunately, the Barry Box is still not 6502 second processor compatible as the Barry ROM makes direct calls to the hardware addresses instead of using operating system calls, this is mainly for speed and convenience, I think, but it does pose a problem when using the box with turbo boards and Fourmeg processors.

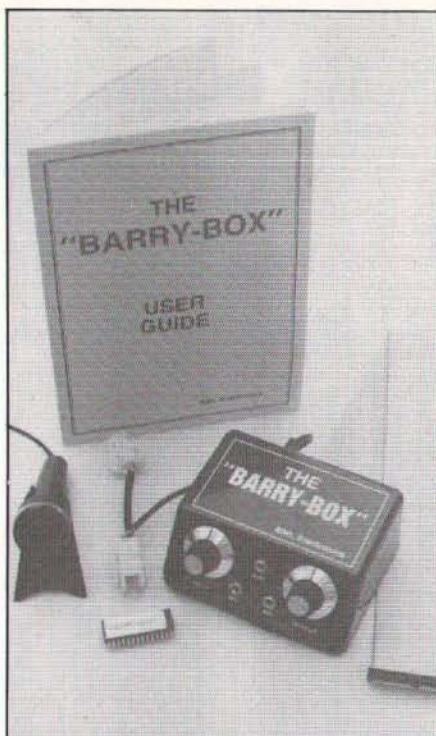
Round the back door

The hardware differences are quite interesting, the addition of an "Auxiliary Input" being the most intriguing.

As readers of my last review were well aware, I was not all that enamoured with the supplied microphone; it was one of those cheap models bundled with portable mono cassette recorders, and it didn't do the sampler any justice at all; *(since writing this review, I have been informed that there will be new and better microphones supplied with the new units, and they will still be able to trigger the sampler and offer a high enough recording level at the same time, so I look forward to seeing them in the near future).*

If you are musically inclined (and say the word "sampler" to a musician and I guarantee they will be all ears), then you no longer need to sample sounds from a microphone; you can now feed any electric instrument into the Barry Box in order to make "perfect" samples via the new auxiliary socket. If you have a friend with a synthesiser, then borrow it for an evening and *voilà*, you've just turned your Beeb into a great little synthesiser at about half the price of even one of the cheapest monophonic synthesisers available!

The auxiliary input avoids the preamplification and filtering stage allowing for a cleaner and more "direct" sound. Sounds put into the auxiliary input are converted into electric pulses and are then sent to be digitized, this is not only useful for electric instruments, but is also good for sensitive and preamped microphones. If you want to sample acoustic instruments in this way, then you can use all sorts of contact microphones including the "C-ducer" range, enabling you to sample acoustic guitars, double basses and violins and many other instruments of this type.



The Barry Box — the only BBC sound sampler on the market

I have occasionally "C-duced" my own violin at home, and was anxious to try it out with the Barry Box. The results were quite good if the sample was taken on a high string, like "E" with no vibrato; if the sample was replayed a few octaves lower, then you have a very convincing "cello" sound, as the bowing action becomes more prominent at lower levels.

The voltage for the auxiliary input should not exceed plus or minus 2 volts, which you will find is suitable for all but the loudest of preamped signals (although you may have some problems with "active" instruments such as "active" guitars and basses or electronic drum kits).

The Barry Box can also be used as a sort of tuning fork. This is designed to produce a sound at a frequency specified by you. The software fills the buffer with a sine wave, and will play it back at any pitch — in much the same way guitar tuners work. You can specify the playback frequency by entering the Barry ROM's menu and selecting (SHIFT) and (f6), the rest is fairly simple.

The Barry Box has been used by a luthier as a fast and efficient way of testing the neck alignment of his guitars; by testing the frequency displacement along the harmonics of the neck, he can check for poor alignment of the neck and fine tune the adjustments accordingly.

Sounding off

The Barry Box has been upgraded quite a bit, the software is a mite faster (although that may be because I have tweaked my Beeb) and the provision for an auxiliary socket is a useful move if, like me, you want to sample electric or transduced sounds.

The microphones supplied with the new Barry Box are to be changed for more modern and higher quality ones, and I look forward to seeing these microphones and compare them with my AKG and Beyer Dynamic series microphones.

I was supplied with another BASIC/Machine Code routine that switched on the "Caps Lock" lamp on the side of the keyboard whenever the incoming signal becomes too distorted. Whilst this partly cures my original gripe about not having a distortion meter (as is standard on nearly every other sampler I have met — including the MCS-1), I still feel that an LED should be built into the Barry Box, especially if more sensitive microphones are being used, certainly if you are use the auxiliary input.

And finally...

The Barry Box is still an innovative and interesting product, there are many applications this unit is being put to, and I can think of a great many more. I haven't even touched on the educational possibilities of this system and many educational software packages are quite easy to modify in order to accommodate the Barry Box, perhaps some software houses should start converting their software for this system as it is a good deal more straightforward than speech synthesis.

The sample quality is quite high — especially if you are running the Barry Box through a separate amplifier — and although it is not a system designed to operate with music composition packages like Music 5000, and on a lesser level, Beebug's "Studio 8", I expect it will only be a matter of time before somebody writes a dedicated music composition package or a MIDI interface to the Barry Box.

Factfile

The Barry Box costs £79.95, and for that you will get the Barry Box unit, a microphone, a printed manual and software in ROM. The units are all available from BML Electronics, 24 Larch Grove, Bletchley, Milton Keynes, Bucks, MK2 2LL. Good news for schools and colleges too, there's an educational discount of 15%, and there's a 2MHz Master 128 version just around the corner too!

THE

ARCADE

The suspense is over at last! Green Beret is here! But was it worth the wait?

Welcome

A bit of tidying up in the column this month, I'm afraid — my poor old machine is unwell and so it seemed a good chance to delve into some stuff you might otherwise not see.

However, we do have the first review of *Green Beret*, which long-term readers will recall as being 'almost ready' since last September's PCW Show. Can any game be worth this build-up?

I was hoping to have that other elusive program as well this month — *Cyborg* — but perhaps next time!

And to wet your appetites and save you dashing straight to the *LOADing Soon section — both *Gauntlet* and *Arcanoid* are on their way for the Beeb! Didn't I tell you that if you were good then you'd get some treats?

Game of the Month

Konami Coin-Op Hits

Imagine

Model B

Tape £9.95

Overall 8

Well, it's here at last! *Green Beret* slips almost unseen into the world, packaged in a 'greatest hits' compilation and keeping excellent company with *Mikie*, *Yie Ar Kung-Fu* and *Hyper Sports*.

The other three programs we've looked at before — *Mikie* is a bit of nonsense (converted by Peter Johnson) in which the school hero has to collect hearts in order to read a message from his girlfriend; *Yie Ar Kung-Fu* (converted by Peter Johnson) is many people's favourite kung fu game (although mine is *Way of the Exploding Fist*); and *Hyper Sports* (what? no Peter Johnson?) is an excellent sports simulation, offering a good selection of swimming, shooting, vaulting, archery, jumping and weight lifting.

All are welcome reappearances on this collection. But what, you'll want to know, is *Green Beret* really like?

Well, I must admit it's a bit of a disappointment. Perhaps it's the incredible build-up it's received but I think the conversion



Violent streak - *Green Beret*

For anybody who has never seen it, the game is simple. As a lone soldier you must infiltrate four enemy installations, killing soldiers with your knife and (hopefully) other weapons you'll gain, leap up and down ladders and platforms, dodge missiles and generally behave in a fairly unsocial manner.

Perhaps I'm just jaded but, despite being awarded Game of the Month, I can't help feeling that this collection has the feel of yesterday and is already out of date. All the games are very playable and you should get a lot of amusement from them but, somehow, we've seen all this before.

Still, I know you won't take my word for it. This game has been awaited for so long that sales were bound to be good unless *Green Beret* proved to be a real stinker. Thankfully it's not and my overwhelming feeling is one of relief.

Still Mackay looks like being a name to watch for, and I'm already in close contact with him to get the lowdown on future plans and so on.

We might even get round to that by newcomer John Mackay doesn't quite capture the spirit of the game.

That's not to say that he hasn't done a good job — the graphics are reasonably large, the gameplay reasonably accurate compared to the arcade version and a lot of fun to play. However, for some reason best known to himself, he's decided to speed the game up quite a bit and, in consequence, it's hard to get into the game. The enemy soldiers come thick and fast and it took quite a few attempts to stay on the first screen long enough to have a good look at the game.

comparison of *Green Beret*, *Commando* and *Who Dares Wins II* that was promised a good few issues back. If only I could get the smell of cordite out of the room...

Repton 3 and a half?

Survivors

Atlantis

Model B/Electron

Tape £2.99

Graphics 6

Sound 4

Playability 6

Lifespan 5

Overall 6

Imagine this scenario — you have to work your way through earth, being careful not to dislodge boulders in the wrong order, so that you can pick up scattered prizes.

Yes, it even looks a bit like *Repton* too! However, there are basic differences — this time you're supposedly working your way in a post-nuclear situation through seven levels of a dome in order to save some hibernating humans. To do this, you have three droids — one eats earth, one teleports humans and the third pushes boulders out of the way.

It's quite fun and should certainly appeal to *Repton* fans desperate for a fairly easy fix of their favourite lizard, whilst waiting impatiently for the new lizard epic, *Around the World in 40 Screens*.

For a budget game, the graphics are acceptable and the game quite fun. I just wish it was a touch more original.

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Repton 3 1/2!

Xor Designer

Logotron
Model B/B+/Master Series
Disc (5 1/4 only) £14.95
Graphics 8
Sound 6
Playability 7
Lifespan 7
Overall 7

The *Xor* world expands in a very welcome manner with this Designer, the first of several *Xor* projects under consideration by Logotron.

You all remember *Xor*, of course. Uniquely previewed as a free disc on the cover of *A&B*, the maze game with a difference has already intrigued many of you with its bizarre world of exploding chickens and free-falling fish.

This, as you might expect, is a fairly standard maze editor, rather similar in feel and easy of use to that included in *Repton 3*. However, as a bonus, there are another couple of new mazes included and the package is as friendly to use as you might expect.

Given an icon-driven system, you can either choose to create or edit new mazes, or else play about with the icon sets — to start you thinking one of the new mazes uses traffic cones and road signs as the icons.

Creating a maze is simplicity itself — just select the icon you require, move it into position on the map and so on. Nice touches include a printer dump, a facility to save your designs and several build-in controls to stop you including the wrong number of heroes, doors, maps, etc.

As a package this is excellent and all lovers of *Xor* will be wise to complete their collection. We're eager here at *A&B* to see any examples of your new mazes and are working quite closely with Logotron to try and ensure that the best do see a wider audience.

If only all games allowed you to edit them at will!

Preview Time

CODENAME: DROID *Stryker's Run* — Part 2 is a hell of a mouthful. Fortunately it is shaping up as a hell of a game. Thanks to the programmers, Martin Edmondson and Nicholas Chamberlain, I've been privy to the game's development and am now able to give to a taste of what is to come.

This is not a review, however — I don't really want to prejudge it until Superior have finished all their tinkering. And besides it's hard to give the Game of the Month award to a game that's already been completely exposed in a preview.

Droid - status report



Codename Droid - Commander Stryker returns

This began life as *Droid*, the original follow-up to the programmers' impressive *Ravenskull*, and the basic thrust of the game has remained constant. The idea is to fully explore four levels of an underground complex, solving puzzles and so on. Originally it was guarded by energy balls and similar nasties.

An early version of the game was showed to Superior who saw the potential in the game for a sequel to last year's successful *Stryker's Run*. A quick change of the graphics for the title character and a rewrite of several parts of the game (notably the inclusion of enemy soldiers rather than energy balls) has produced a sequel that is, I think, stronger than the original.

The graphics are excellent (smoother, too) and the added complexity of exploration, platform gymnastics and puzzle solving gives the rather insipid hero a whole new dimension. The puzzles are worthy of any arcade adventure and it will appeal more to *Citadel* and *Ravenskull* fans than it will to those seeking another simple *Stryker's Run*.

But it is the graphics that make this such a great package: gargoyles, for example, that turn to watch the hero's progress across the screen. The solution promises to stretch a few brain cells and I, for one, can't wait to see the

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final released version this Summer from Superior.

I could hardly do better than to remind you of what I said last year when reviewing *Ravenskull*: these are programmers to watch! After this year's exams they are determined to write their best game yet, another original. Thankfully *CODENAME: DROID* (no, I can't be bothered with the full title) will keep many of you happy until then!

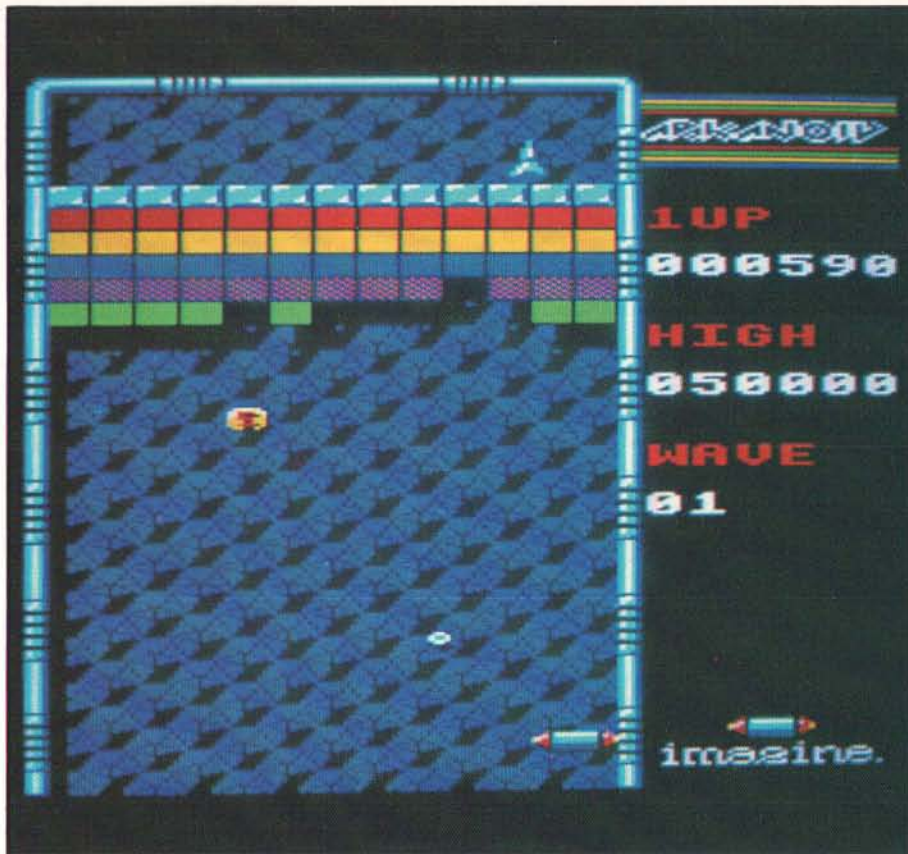
Preview time

Been in an arcade lately? Got friends with other machines gloating because they've got the game of the moment. Well, your worries are over because *Arcanoid* is here for the BBC, converted by Peter Johnson, and it is superb!

For those of you who don't know the game, you may well be a little surprised by all the fuss. After all, it's just an updated, slightly flashy *Breakout*, isn't it? Well, yes and no. Yes, because the basic gameplay involves hitting a ball with a bat against a wall of bricks trying to demolish it and, no, because there is so much more to the game. Firstly, the bat allows you to hit the ball at different angles and you'd be well advised to practice what I call the 'spin shot' that cuts the ball from the side wall into the heart of the bricks, thus gaining extra time before it descends again.

Next, some bricks drop bonuses that you can collect if you're quick enough — extra lives, longer bat, shooting cannons or the ball split into three, for example. Some 'bonuses' counter these effects and it is always worth considering whether it is worth the chance of losing the ball for the possibility of getting a bonus.

The first wall you meet is right across the screen, six bricks deep. The first five layers are as you might expect, but the final layer of bricks must be hit twice before they



Arcanoid - compulsive classic

disintegrate. Behind them are some strange little walkers which move down the screen when released and deflect the ball in unexpected directions. Later screens offer more (much more!) of the same, with different wall layouts, unhelpful aliens and so on.

The conversion by Peter is superb — smooth graphics, realistic sound and, above all, the feel of an arcade game on your BBC. The version I've seen was not quite complete (a few

attribute problems still) and I'm not going to say any more about it — better to whet your appetite for the release version next month.

If this doesn't get my Game of the Month award, then there's a completely unknown killer game out there somewhere. I've been playing this constantly; you will too. Start saving your pennies now!

Solution Corner

Last issue we were lucky enough to have the solution to the first level of the complex *Ravenskull*, provided by programmers Edmondson and Chamberlain. Now prepare for levels two and three.

Next issue we'll finish with level four, again complete with clear graphics allowing you to amaze your friends with your arcade adventure solving skill. The text below may look complex and dense, but bear in mind that with the game on screen and the screen dumps by your side it should make complete sense.

Level Two Firstly, assume you pick up all treasure unless told not to. From start crossroads go left, down and into pink maze. Right to end, down, second right, second up, right, up, left, second down, get scrolls — use left one (strength). Up, right, down, right, down to bottom, left, up, push boulder, left, second up, right, up, second left to get key, use other scroll (teleport). Beware pressure pads in this area.

Teleported to bottom left of level, collect treasure, go through plants and get scythe,

return to T-junction and go left to crossroads. Up to T-junction, left to green striped maze, pick up potion but don't use (slow) down, collect all treasure and return, up to room full of bees. Right, eat fish food, drop bone, left at entrance to garden, use scythe to cut path to spade (use alcove to turn towards plant), drop scythe, get spade, south, round garden, get optional (high speed) scroll, return to bee room.

Drink slow potion, enter bee room (when first three bees are close together), get treasure and spell which will cancel slow motion, use after exit from room, return to maze entrance and leave.

Right at T-junction (earth above leads to final room on this level), right, stop at gate with treasure to right. Beware pressure pads, do not collect treasure at right. Down, up, down, left at T-junction, left all way round, collect gem from under pink wooden block. Don't enter room with two downward and one upward blocks. Back to T-junction, down, door slams behind you, get treasure, use scroll (strength) and push way out down, right, down, use key

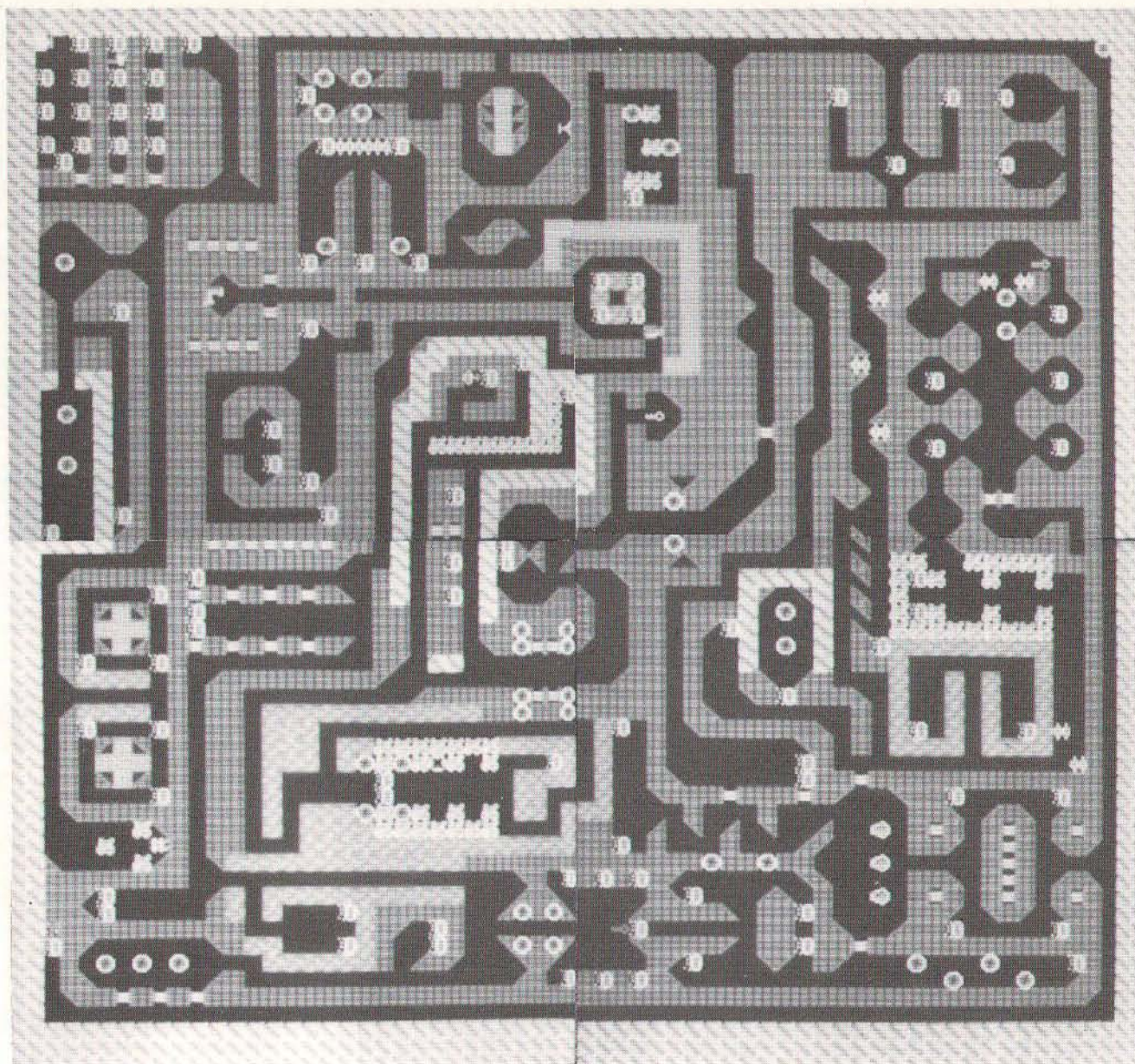
from pink maze on door, drop key, return, right, first left, return, up other passage, first left, don't step any further than next two pieces of treasure.

Return, treasure in alcove, round to right, push block up and escape, right, push block up, enter block maze. This is very complex — you need to push blocks to make or block and exit (well, we can't do it all for you!). Leave by same exit, along passage, final left, stop at block, push it, use key to open door, use spade to dig along passage, enter, door slams, collect crucifix part.

Level Three Right, left, first up, down, left, up, right at T-junction, up at next, return, right and get dynamite (avoid acid blocks). Return to start and drop dynamite.

Go to main T-junction (right of start), left, note three locked doors to left, up, first left, back, up to top of castle. Wait for third bee to pass and turn, follow closely, duck into first

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Level Two

down exit (don't collect treasure yet), then up, right to corner and down to bottom of level, get (time chime) scroll. Return all way back (avoid bees!) and stop just below pillar on left side of level.

Down, second right, stop at kink and watch bee. Along to right is time door, bee flies against this. Use scroll, it ticks eight times then 'dings', meaning door is open for a fraction of a second. It will be just off screen so judge your dash for it carefully. Note bee can also fly through it. Drop scroll.

Through door, past two pillars, left for key (opens top one of those three doors), return to T-junction and continue, stop when you see bee, follow it closely and take first exit. Return taking care as bee's path is shorter (door has shut), collect bow and arrow with which you can now kill any bee. Continue round and then go down and round.

Left by pillars, continue round, collect compass and go round till you get to time door. Shoot bee and continue till reach vertical passage to left of level, down to doors, open

top door with key, notice axe, drop key. Up again, first right, into room with wineglass, drink it and drop glass (200 health units). You are now drunk so use compass till sense of direction restored, drop compass, sown, return to vertical passage, up, second right.

At T-junction go up, return, down, take lower route, return, take top route, stop at kink, shoot bee, down at next junction, don not enter room, down, return to previous junction and go up. First left, return, up (beware spiked gates), enter small acid block room, left into room with alcoves, collect four treasures on right, get key, pick top treasure, return to vertical passage, down to locked doors, collect treasure near acid blocks.

Open middle door, get axe, drop key, right round again (as for time chime scroll sequence) and drop down into entrance on top passage, return and continue. Use axe on first door, drop it, up to top and get third key, return to final door and get detonator.

Back to start room and pick up dynamite, return to hole you made with axe, enter,

down, left, down, up, right till you get to room with potion. Move this but don't take it, drop bow and arrow for a while, down, drop dynamite at bottom of passage, retreat a couple of blocks and use detonator. There should now be three exits.

Drop detonator, right, return, left, return, down for part of crucifix.

Phew! That should keep you quiet for a month! Remember to use this solution with the game on screen and the map to hand as well.

Boom, Boom!

Trivial Pursuit: Baby Boomer Edition

Domark

Model B

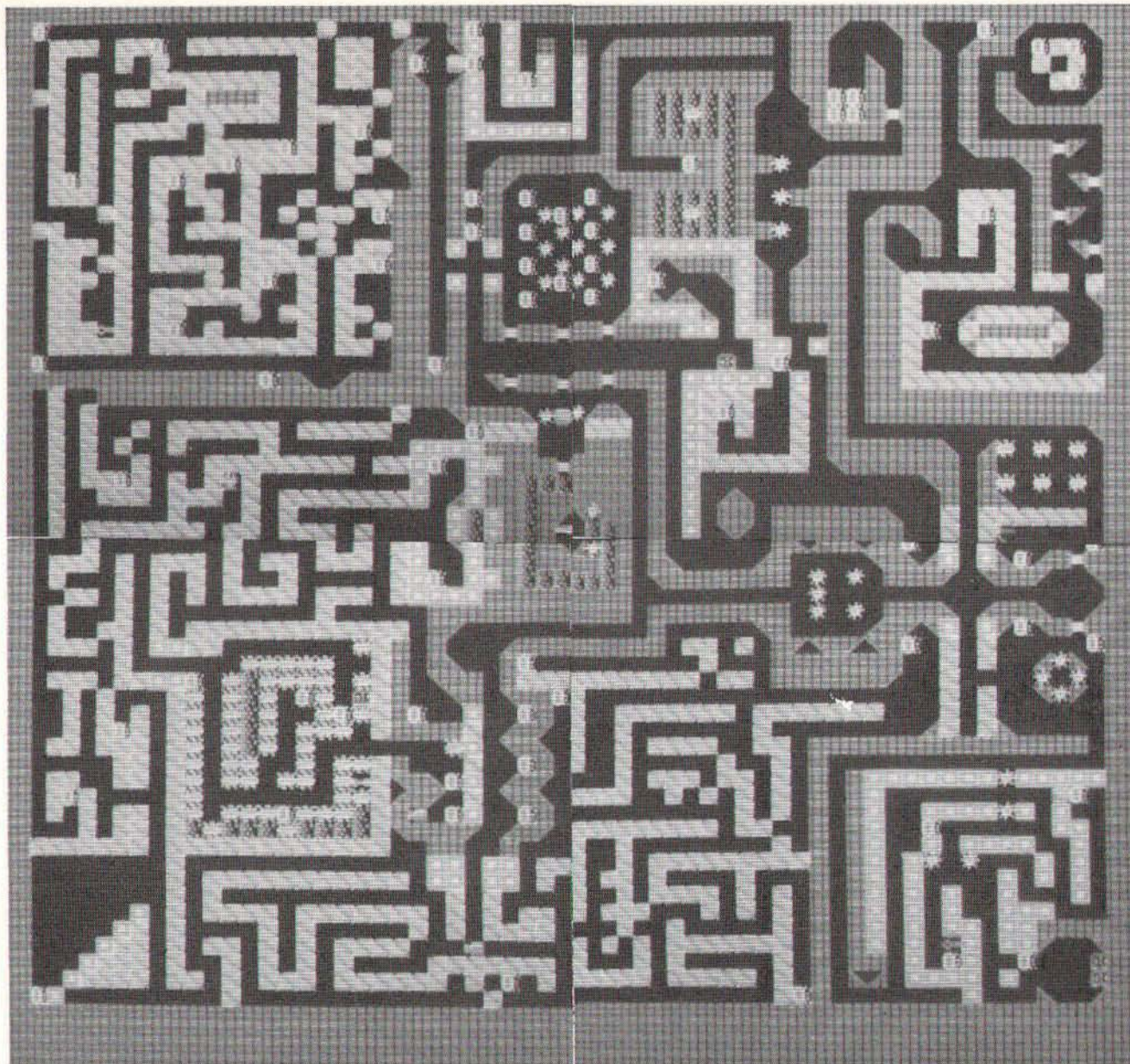
Tape question pack £7.95

Disc question pack (mail order only from Domark) £7.95

Graphics 6

Sound 6

Playability 8



Level Three

Lifespan 9
Overall 8

The *Trivial Pursuit* clones continue — this is the third set after *Genus* and *Young Players* and, for once, I'm really at home here! The questions this time are aimed directly at those who remember or relish the '60s.

As ever, this is available either as a set of extra questions to the *Genus* edition or as a stand alone dual tape/disc set (priced £14.95 and £19.95 respectively). If at all possible I would recommend the discs, as loading questions from tape can seem to take forever.

The screen layout and method of play are as before; the difference comes with the question categories. This time you have broadcasting, stage and screen, nightly news, publishing, life and times and RPM (music) to think about.

Trivial Pursuit is a phenomenon and I'm sure that any players of the board game have already bought the *Genus* computer version if they were going to buy any. This pack's value to you depends on how you respond to the '60s.

Typical good production and value. Can you dig it?

Magic!

Micro Power Magic II
Micro Power
Model B/B+/Compact/Electron
Tape/disc £7.95/£9.95
Overall 7

Ah, doesn't it make you feel nostalgic for a simpler age! No mega-games loading each new level from disc, no protection routines testing for *Replay*, no large prizes for completing the game, just good solid entertainment.

This, the second Micro Power raid of the vaults, is not as strong as their first compilation but, for the price, is totally irresistible. The games suffer from being a melange of great and awful but for less than a pound apiece there is not much complaining from this reviewer.

Most compulsive of all is the classic *Mr Ee*,

a variant of the old arcade classic *Dig Dug* — worth the price on its own (I think). This game with its maddeningly simple gameplay (collect the food whilst trying to drop apples onto monsters) hardly shows its age at all. Likewise *Frenzy* offers you a simpler version of the recent *Kix* without the frills.

Felix in the Factory (standard platform game), *Positron* (early *Invaders* variant by Gary Partis), *Bandits at 3 o'clock* (two player joystick battle) and *Cybertron Mission* are all the sort of game that is fun to play but you're glad you didn't pay full price for.

However, the inclusion of educational games such as *World Geography* and *Junior Maths Pack* does seem a little misjudged given what else is available from the Micro Power backlist — *Swoop*, *Rubble Trouble*, *Space Jailer* etc.

Overall, not as strong as the first *Magic*

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compilation but still excellent value and worth thinking seriously about.

Student of adventure games?

Oxbridge
Tynesoft
Model B/Electron
Tape £7.95 (Disc version promised soon £12.95)
Graphics 5
Sound 5
Playability 6
Lifespan 6
Overall 6

Now, here's an oddity. In a time of American license deals and hard-working in-house programmers, Tynesoft have accepted an adventure sent in to them. As if that wasn't enough of a bizarre story, wait till you hear that the BBC version has 300 illustrated locations (200 for Electron).

Phew! Of course, a number of them are very similar or identical and none will win prizes for pushing computer graphics to the limits but they do add a nice touch to what is a fairly standard adventure set in the world of higher education.

Moving around Oxbridge, you must solve various puzzles and mazes as you might expect but there is a welcome amount of humour here (not quite to Lever/Jones standard, however) and certainly the subject matter is a very welcome change of pace from the near-inevitable spaceships or goblin lands of most adventures.

Seasoned adventurers aren't going to find too much here that will challenge them for long, but those dipping a toe into the puzzle waters could well find that this is a pleasant place to start.

Rather laboured

Hercules
The Power House
Model B/Electron
Tape £1.99
Graphics 5
Sound 4
Playability 6
Lifespan 5
Overall 5

First release from CRL's new budget label, this platform game by Gary Tomlinson doesn't really deliver the goods I'm afraid.

Based on Hercules' 12 Labours, you are placed on a randomly chosen screen and must gather an object to pass to the next. Some screens are very sparse and, in fact, a good number of platforms are invisible. Given a bit of time, you'd do well to map the screens but, unfortunately, the game (claimed to be 'infuriatingly addictive') didn't provide me with the impetus to do any such thing.

Don't be misled by the attractive inlay card, this is a real disappointment. Strangely, there is also a free audio track by House Electronic Xperience included which is quite pleasant,

more pleasant in fact than the accompanying game!

Drifting along

Star Drifter
Firebird
Model B/Electron
Tape £1.99
Graphics 6
Sound 5
Playability 6
Lifespan 5
Overall 6

Released a couple of years back on the mid-price Firebird Super Silver label, this arcade adventure by Tim Wilkinson and John Day offers great value for just £1.99.

The idea of the game is to discover clues from an abandoned spaceship, solving puzzles as you attempt to gain access to initially closed sections. The graphics are adequate, the game play acceptable and there are 120 rooms to explore and map.

There is nothing wildly original here but the game is solidly constructed and is amusing enough. Interestingly, on first release it was marketed for the BBC only. I've not bothered to investigate too closely if it has been recoded for the Electron too but at first sight I don't think so — it has the intensely annoying Melvyn Wright steam organ loading screen as before, for instance.

Nice to see Firebird catering for the lower end of the price market at the time when their *Sentinel* and *Cholo* have virtually exclusive control of the expensive end of the BBC range.

Get hacking!

The Hacker
Firebird
Model B/Electron
Tape £1.99
Graphics 6
Sound 5
Playability 5
Lifespan 5
Overall 5

Another Firebird reissue by the Wilkinson and Day team; this time of a fairly standard platform game set inside a giant computer.

Leap from platform to platform, collect the miniature floppy discs, avoid the fatal chips and so on.

Nothing outstanding here but a welcome rerelease on a budget label and it should please platform fans who haven't seen it before. How about some new games, Firebird, in this budget-range?

Bird Strike

Firebird
Model B/Electron
Tape £1.99
Graphics 4
Sound 4
Playability 4
Lifespan 4
Overall 4

This was inevitable, I suppose, as Firebird moved through their possible titles for reissue. This is the worst of the original Firebird games, involving shooting down carrier pigeons!

Perhaps they should have been turkeys!

Olympic Spectacular

Alternative Software
Model B/Electron
Tape £1.99
Graphics 6
Sound 5
Playability 6
Lifespan 6
Overall 6

First seen back in the distant days of 1984 as *Micro Olympics* from Micro User/Database, this is a straight budget rerelease by Alternative, who seem to be mopping up a number of old programs and throwing them onto the market to sink or swim without the benefit of publicity or review copies to magazines.

When first seen this sports simulation (offering five running events, three throwing events and three jumping events) seemed like great fun. Now, after a number of other superior sports releases, it looks a bit tired.

Certainly not worth buying if you already have Tynesoft's *Summer Olympics* or Imagine's *Hyper Sports*, this may appeal as a pocket money substitute only.

Good, however, to see Alternative crediting the original release on the inlay card — that should save some of you buying this in error as a new game.

Cholo revisited

The Arcade's very early reviews of *Cholo* at the end of last year were complimentary but, with all such unfinished copies, there's a danger that the finished game will not live up to expectations.

Certainly R York of Narborough feels cheated by my overall score of 8 for the game — "I was vastly disappointed when comparing it to *Elite* as you did in your review".

Well, excuse me! You must all realise that these reviews are subjective and I merely try to let you know my feelings about games. The overwhelming response to the column suggests that I'm not doing too badly.

And *Cholo*? Well, now having bought (yes, bought!) a final version I am even more knocked out by it — it is compulsive, thoughtful, original and supported by an excellent package of instructions, novel and map. Had I seen all this when I reviewed it, I would have given it '9' overall.

Sorry about that, Mr York.

Successful? You bet!

Any amongst you who dream of becoming programmers but have not sent off for Superior Software's free booklet *Success in Software* must be dumb.

Do it today — the booklet by Superior's

MD Richard Hanson is excellent and contains some invaluable tips about all aspects of game writing and marketing.

Superior are at Regent House, Skinner Lane, Leeds LS7 1AX Tel 0532 459453

Disk Users

By now you should all have realised that *A&B* has a new sister magazine on the stands — Disk User. In a revolutionary format (programs on disc supported by documentation in a magazine), the purchase of the title on a regular basis should become even more essential when The Arcade spawns a sibling there.

Each issue from now on I'll be taking a couple of pages to discuss games released on disc format, hints and pokes for disc versions and anything else that seems suitable for the disc-based gamer.

Any specific disc hints are welcome at the normal address. See you in Disk User?

Programmer Profile: Peter Johnson

Since beginning this series of focuses on programmers, one name above all others has headed the readers' requests — Peter Johnson.

Well known for a string of Superior titles and, more recently, a non-stop schedule of conversions from other machines, he is a highly visible and prolific programmer. But who is he? Trust the Arcade to track him down and invite him to bare his soul! Over to you, Peter.

"I started out playing with a PET that was lying around at college while I was doing my 'A' levels and it interested me sufficiently to persuade my father to buy me a ZX81. I bought a 16K RAMpack a couple of months later and this seemed to be more memory than you could possibly fill! The interest in computers got me onto the HND Computer Studies course at Newcastle Polytechnic.

"Around Christmas 1982 I bought a BBC and in the six months before the end of my course I wrote BASIC versions of games like Missile Command and then, when I'd learnt machine code, a lightcycles game that sold about 12 copies through a local shop. I managed to finish Q*bert the day before my exams started.

"I sent it off to about 12 different companies and didn't expect to hear anything for some weeks. After my first exam, my mum told me somebody had phoned offering '1000 for the game and, for the next few days, I'd rush home after exams to find out who had rung! I passed the HND and decided to sign with Superior — I'd seen a lot of Richard Hanson's games and he seemed prepared to give me any help I needed.

"Q*bert was only on sale for two months before Sega objected on copyright grounds and it had to be withdrawn. I still managed to make about '1500 and spent it on disc drive, printer and monitor and started work (now full-time)

on the next game.

"I wrote nine games for Superior, some with the help of David Lovekin who I took on as a trainee for a year as part of his sandwich course at Newcastle Polytechnic. What should have resulted from this is VTOL, unfortunately never finished although David has said that he will complete it if there is enough interest. Pirate copies of this are in circulation.

"Crystal Castles was written for Atarisoft but unfortunately it fell foul of the Joust syndrome and wasn't released for two years, eventually by US Gold. Next I did a whole series of conversions for US Gold/Imagine, of which my favourite is Impossible Mission and my least favourite is Mikie — mainly due to the game design. Deathstar is also a personal favourite.

"While writing Yie Ar Kung Fu II I moved into my own house — a four bedroom, semi in a quiet area — with my girlfriend, a chemistry graduate from Newcastle University. I have one room devoted to computers and one for my music studio.

"I've started work on an Amstrad conversion of Citadel with Jason Sobell, but we decided that the Amstrad market was about to collapse and that the ST and Amiga looked more interesting. To date I've written Arkanoid on the ST, which has been received very well, and am determined to write on the Atari and build up as much of a reputation as I have for the BBC, but with the added attraction of worldwide sales if the games are good enough.

"One project under consideration is an ST version of VTOL, with close-ups, Top Gun style 'photography', digitised sound and pictures. Another is an ST conversion of Superior's very promising game By Fair Means or Foul. And apparently Ocean have lots for me.

"As to future BBC games, that depends on whether or not I get good enough offers to tempt me away from the more 'glamorous' ST work. And, despite earning about £20,000 for the Electron Overdrive, an Electron Arkanoid looks unlikely.

"When not computing, my interests are music and theatre. I play guitar in a band for several theatre groups, play, sing and produce demos of my own and other people's music and have done some minor professional acting and dancing roles. I've even appeared in several photo-stories for girls' magazines! Not bad for 23!

"My favourite game is hard to detail. I tend to get fairly bored with games quite quickly, but arcade favourites have been Gauntlet, International SuperSprint and Rolling Thunder. I have a pub Asteroids machine at home and, to help my conversions, a suitcase version of Arkanoid.

"I'd like to say thanks to Jason Sobell, Kevin Blake and Dave Mann, who've all been a help at some time in many of the games, either technically or playtesting."

Thanks, Peter. Before we move on to Peter's checklist of games, I'd just like to pose a quick question for you all. What is it about Newcastle that produces so many programmers?

Peter Johnson Games

The following games are all for the BBC; (E) denotes Electron version.

Light Cycles -unreleased
Q*bert — Superior
Spitfire Command — Superior
Star Battle — Superior
Overdrive — Superior (E)
Wallaby — Superior
Space Pilot — Superior
Star Warp — Superior
Airlift — Superior
Crystal Castles — (Atarisoft)/US Gold (E)
Deathstar — Superior (E)
Beachhead — US Gold (E)
Yie Ar Kung Fu — Imagine (E)
Mikie — Imagine (E)
Impossible Mission — US Gold (E)
Yie Ar Kung Fu II — Imagine (E)
Arkanoid — Imagine (plus ST version)

Note that many of these are now available on compilations; as Peter says of the Superior collections — "I am getting as much out of them as for one new game".

If anyone has copies of either *Light Cycles* or *Q*bert* then I'd like to hear from them.

Johnson Tips

Unlike many programmers, Peter doesn't put cheat modes into his games. We've carried a few pokes for his games in previous issues, but for now I'm pleased to offer you two exclusives.

Firstly, his hints for *Impossible Mission* and, secondly, his own map for *Overdrive*, which hopefully will make the game easier to complete! Back to Peter.

"The key to *Impossible Mission* is observation. When you enter a room, study the paths and response patterns of the robots before planning your route across the room. Note the position of each lift so that you can take the shortest route.

"Some rooms may be easier from one entrance so look for alternatives. Generally I find it best to search all the rooms on the first liftshaft before working my way across to the next.

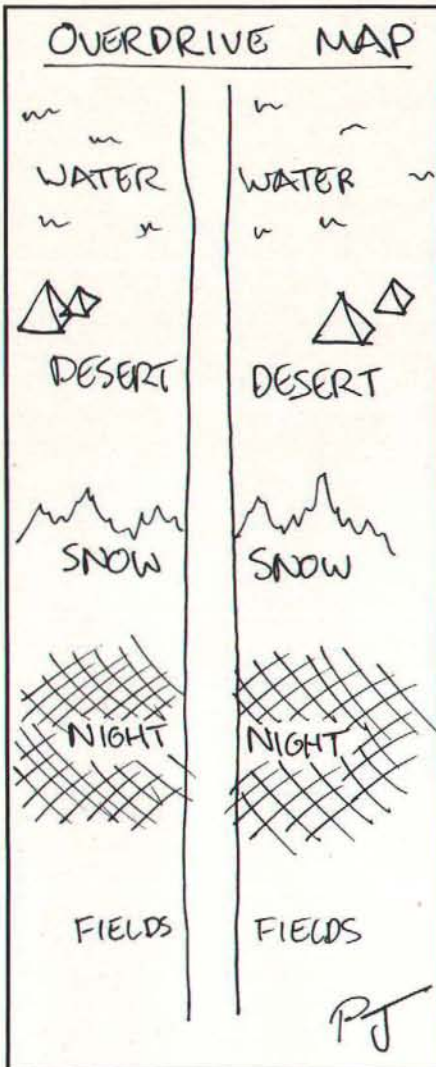
"If a room is very hard to complete, then leave it and return later if you are still short of pieces.

"Try to do well in the puzzle rooms, as those extra passes come in handy later on. Save the passes till you need them in a hard room — but it's better to use a pass and live than to waste ten minutes dying and needing the pass to complete the room anyway.

"Don't use the computer till you have most of the pieces — it isn't worth the time until you need it. To speed up the pattern matching, instead of sorting through the store matching each in turn against the four locations, try setting all four to the same orientation and colour. Go through the store checking any piece that matches, then flip them all and start again until all the permutations are exhausted.

"Good luck!"

C O N T I N U E S ►



Above: world exclusive map of Overdrive by Peter Johnson

Hints'n'Tips

Imogen Passwords

What, already? Yes, we don't hang about here in the Arcade. Here, for your enjoyment, are the passwords codes for the superb *Imogen* thanks to 'The Reverend'.

My review of the game last month, making it 'Game of the Month', was based on a demo version with just two levels. Having now seen the full version, I'm even more convinced of its quality and style. Not perhaps the hardest of puzzles found in arcade adventure field, but the graphics, humour and friendliness of the game ensure that you'll return to it again and again even when you've solved the various levels.

Next month we'll have some playing tips (and details of the 'illegal' passwords!) but for now:

- A — BALLOONACY
- B — DRIPPING STUFF
- C — SEE-SWORD
- D — GNU-PROBLEM
- E — WHIP-IT
- F — SAXOPHOBIA
- G — DOWN-AND-OUT
- H — FOLLOW-ME
- I — DUCK-EGG-BLUES

- J — PAVLOV-WAS-HERE
- K — TENDER-HOOKS
- L — BABBOONACY
- M — APPLESOURCE
- N — HAMSTER-JAM
- O — FIRE-WORKS
- P — TIME-FLIES

Cholo challenger

Owners of an Opus Challenger unable to play the excellent *Cholo*, should now give thanks to Robert Pearse.

The following sequence is the answer to your prayers:

*LOAD O.C 1313; ?&3E94=&31; *SAVE O.C 1313 3E98

Imogen Challenger

Owners of an Opus Challenger unable to play the excellent *Imogen*, should now give thanks to Jonathan Temple.

The following short program should be RUN before playing the disc:

```
10 !&380=&5D08BC9
20 !&384=&1D000E0
30 !&388=&E7724C60
40 PRINT"Now insert IMOGEN disc"
50 PRINT"and press a key"
60 IF GET THEN *DR.0
70 ?&20A=&80;?&20B=&3
80 *RUN !BOOT
```

Sentinel codes

Sorry, I just can't face typing in any more level codes this month!

Normal service will be resumed as soon as possible.

*LOADing soon

● Hot news, hot news! An official version of *Gauntlet* for the BBC is on its way, but I'm sworn to secrecy about the company and programmer's identity. Keep reading this column and you'll be first with the news.

● US Gold's budget reissue label Americana is now being marketed by budget kings Mastertronic, with *Bounty Bob Strikes Back* already rereleased cheaply. Most games should stay at £2.99, although there are plans to introduce a £1.99 range as well.

● We're not usually ones to blow our own trumpets here at A&B but someone has to tell you that in the first three months of 1987 the sales of A&B rose considerably; sadly (for them) the sales of the other two newstand BBC titles fell in this period.

● The success of Domark's *Trivial Pursuit* grows by the hour. Planned for later in the year is a set of *Genus II* questions.

● Another welcome entrant to the Beeb disc pricing circus is Bug-Byte with news of compilations with competitive prices.

● Quick new games update: Gremlin's *West Bank* and *Jack the Nipper* are rescheduled to the autumn; Martech's *Satellite* due this summer; news of Tynesoft's US licensing deals due soon; Audiogenic's budget disc line (*Deep Down*, etc) due this autumn; Mirrorsoft's simulation *Spitfire 40* should be ere next month; horrific rumours that after *Paperboy*

(supposedly awful), *Elite* will drop out of the BBC market again; Bug-Byte has rereleased two Lothlorien strategy games *Roundheads* and *World War I*; Superior's next three releases should be *Around the world in 40 screens* (the new *Repton* featuring redesigned characters and *Repton 3* editor), *Stryker's Run II* (please note: not the full title!) and *Crazy Rider*, the motorbike racer; Domark's *Eureka II* now due 1988, whilst their *Star Wars* is on hold; what else? Wait and see!

*LOADing at ASL

As befits one of the major BBC software houses, ASL (in the form of development manager Darryl Still) have divulged a whole parcel of exclusive news titbits for you.

Firstly, the *Daxis* update: it seems that Gary Partis has lost his impetus with the game and is taking abt of time off to concentrate on the blaster *Zatylys*. Word is that *Daxis* will appear, whoever finally codes it.

Ennui has also struck Peter Scott, whose *Gauntlet* type game *Ransack* has undergone a radical rethink into a major, multi-screen, scrolling shoot 'em up. His first three games, so far unseen, will be appearing on the budget Top Ten label of new company Maynard International (headed by ex-MD of ASL, Martin Maynard) — these are *Yoyo*, *Pandemonium* and *Network*. That should complete the release of every completed Scott game.

Partly as a result of a programmer plea in these pages, ASL have signed up some new talent and their first releases are beginning to be scheduled.

Dean Lester (a medical student from London) has a 3D perspective program (for now called *Benji*) under development and *Saracoid* coming on *Powerpack 2*.

University student Philip Whitehurst has two titles slated for *Powerpack 3* and expects to do some new games after his first year exams. You may recall his *Firebird* games, *Fat Man Sam* for example. Another new name, however, is Alexander Loh, also appearing on *Powerpack 2*.

Warehouse is the first title on the Top Ten label and author Philip Watts and partner are working on a game for ASL. Nick Dowler has also been signed up.

Finally, one of the authors of *Flip!*, John Dale, also has an exciting project under development.

So when will we see some new games? *Powerpack 2* (due Summer) will contain *Psycastria*, *Thunderstruck*, *Last of the Free*, *Drain Mania*, *Frankenstein 2000* and two new games: *Saracoid*, which promises big smooth graphics in a cross between *Galaxians* and *Caterpillar*, and pub machine simulation *Froot Raid*.

Remember, I can be reached on **Micronet mbx 919999020 (RV)** or, by post: Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB

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UNISTAT 2

In the February 1987 issue of A&B, I wrote a comparative review of several of the statistics packages available for the BBC. These were practical number crunchers for computing the results of statistical tests on sets of data (see previous article) rather than educational programs. Apart from one very specialised and expensive regression package (FIRST), I looked at general stats programs in the price range £15 to £50. Each had their advantages and all omitted some features provided by others, but on balance Statcalc from MacMillan was regarded as providing comfortably the best value for money.

It's in a different class pricewise. Is it reflected in the software?

The package reviewed here, Unistat 2, arrived too late for that review, but is well worth an update article in its own right. This is a second edition of the package from University Software which has been around for quite some time. It is a general purpose statistics package in a different price range (£140 plus) to those discussed earlier, but with a number of major advantages for those who can afford the extra cost. In particular, it (1) has a much superior user interface and file creation system (2) maintains data sets in memory whilst different programs are loaded in and out (a major advantage for single disc drive owners in particular) (3) is much faster in computation (4) has the ability to compute probability values for most statistical distributions saving the user need to access statistical tables, and most importantly (5) is far more powerful in both the range and complexity of statistical analyses provided.

To take the user interface first, Unistat 2 allows data to be entered and edited in a spreadsheet type fashion which is much superior to the crude editors provided by any of the other programs that I have seen (including that of FIRST). Compared with a ROM based spreadsheet it is a bit slow and flickery and lacks some of the standard facilities. On the other hand the editor has some facilities not found in conventional spreadsheets — for example it will sort columns (or matrices from a key column) into numerical sequence, and can compute the rankings of a column of numbers. You can use it, however, simply as a full screen editor to enter your raw data before presenting it in memory (or via a file) to one of the analysis programs, since any ranking procedures etc required by a given test will be performed automatically.

The spreadsheet style editor has a number

of advantages, however. In my own research, for example, I frequently need to perform my statistical analysis not on the raw data themselves, but on some processed form of the data. The Unistat editor not only allows standard transformations such as $\log(x)$ to be performed, but also allows one to compute indices involving combinations of data from the raw columns which are then copied to a separate part of the sheet. You do not need to delete the raw data before performing analyses, however, since each of the statistical programs allows you to specify which columns of your sheet are to be used in the test. Another very good feature of the editor is that it allows files to be saved and loaded in ASCII (pure text) as well as Unistat internal format. This means, for example, that you can import data spooled from a spreadsheet ROM such as Viewsheets or Inter-Sheet and also means that you can export data to a word processing program for editing into a table.

The main boot up menu allows you to inspect a set of start up options which are saved in a file on the master disc (and can be replaced). These include an option for 80 column editing which is only permitted on shadow RAM machines. Unistat appears to select shadow RAM automatically since this worked on my Master 128 without the need to type *SHADOW. Apart from this and the editor, the other options fall into a number of categories which I will discuss in turn. A sequence of menus and submenus on well designed Mode 7 screens make the passage through Unistat's many options easy and safe to follow.

Many more besides

In my earlier article I presented a table of statistical tests and other features to show which package could do what. Between its various options Unistat does all of these and many more besides. If I gave a table of everything it does here, it wouldn't fit on the page! However, I will try to indicate the range of facilities offered. One option is for a powerful multiple regression package which like most other routines in Unistat can handle missing data points. The regression facilities include plotting of residuals, ANOVA of regression and plotting of multiple correlation and variance-covariance matrices. The regression facilities do not include everything offered by the FIRST package (eg non-linear regression) discussed in my previous review. FIRST, however, at a similar cost is highly

oriented to regression methods and is much less of an all rounder than Unistat.

An incredible number of facilities spring from an option called 'Statistical tests, correlation coefficients and probability distributions'. The statistical tests included cover all the main parametric and non-parametric significance tests for experimental comparisons, excluding ANOVAs which are covered by a separate option. Tests for one sample, between and within designs are provided, of course, plus the F test for differences in variance. The non-parametric collection is remarkably extensive and complete. All the usual variants of chi square are covered plus Mann-Whitney, Wilcoxon, Freidman and a number of other lesser known tests, including those for monotonic trend analysis such as Page's L and the Jonckheere trend test. Correlation coefficients not only include Pearson, Kendall and Spearman but also point biserial and tetrachoric correlations. Probability values are generally given with test results, but may also be accessed directly for a variety of distributions as a substitute for statistical tables.

The analysis of variance (ANOVA) option goes well beyond anything I have seen on a micro package before in terms of the complexity of designs handled, permitting up to three way analyses with all combinations of independent and repeated measures on factors. However there are no facilities for break down analyses such as planned or post hoc comparisons, or simple main effects. With full ANOVA tables printed out you can, of course, compute these for yourself fairly easily. Two final options provide for the calculation and presentation of chi square expected frequency tables and cross-tabulation, and for plotting and printer dumping of high resolution graphical displays.

In conclusion, Unistat 2 is a superb all round statistics package combining ease of use with remarkable power and range of facilities. It is aimed at a specialised and sophisticated group of users (eg university and industrial researchers) for whom the documentation should prove quite adequate — there is no tutorial content and the conditions of applicability of tests are not specified. You obviously cannot expect this kind of specialised software to sell like an arcade game, so given the enormous practical value it offers those at whom it is targeted, the price asked is extremely reasonable. *UNISTAT II is available from UNISOFT LTD, P.O. Box 383, Highgate, London N6 SUP price £125 + VAT.*

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GENIE 'lives' on a small circuit board only 3 inches square.

The GENIE System hardware uses a totally new memory paging technique, developed by PMS, which maps 32K of ROM and 64K of RAM into the address space of a single 16K sideways ROM.

The GENIE board is connected to the computer via a single header on 6 inches of ribbon cable. This header plugs into any ROM socket on the main BBC, MASTER or COMPACT board.

NO flying leads—NO soldering—NO modifications.

GENIE can produce address labels, and pages of the diary notepad can be output to a printer.

In addition to these, stored in GENIE's memory are ASCII tables and lists of commonly used conversion factors eg metric to imperial units.

All the utilities in GENIE are MENU DRIVEN, making full use of cursor and function keys.



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HOME OFFICE

Home Office — Books

We've found a new publication for the *home office* bookshelf this month, a guide to the View family which you can stack up against those manuals and crib cards. View has always been one of the most popular pieces of software for the BBC Microcomputer. Its 'official' nature as a piece of Acornsoft programming and its inclusion in both Master 128 and Compact micros has ensured a wide user base. The rest of the applications Sheet, Store, Spell, Plot and Index have provided a family of software as yet unmatched by third party products. Author Clive Williamson has concentrated on the big three applications of wordprocessor, spreadsheet and database in this new book, *Mastering View, Viewsheet and Viewstore* published by Sigma Press, price £12.95.

Following an introduction and preliminary chapter on suitably setting up your system, especially the printer, there are four sections: 74 pages on View, 48 pages on Viewsheet, 53 pages on Viewstore and 25 pages on Integration. The author does an excellent job in not reproducing the manuals but jumps cleverly in to clear up a misunderstanding, explain the meaning of a command, on occasion to discover a feature you didn't know was there and often to take you through the more awkward features step by step.

The advanced user of the View family will not gain much that is new but then he probably became 'advanced' the hard way. The release of View as part of the Master Series has created a situation where many users do not have access to the full manuals and also the complex Viewstore suffers from confusing documentation. There is therefore a need for a bit of plain talking and Clive Williamson has provided this and more besides. His own illustrations (created with Bitstik), printouts and photographs make for a lively presentation.

The book contains a couple of straightforward program listings and some handy function key definitions but concentrates on the applications software itself and what can practically be achieved. Viewindex and Viewspell only get one page each in association with View and Viewplot gets a few lines under Integration. This latter section is a useful look at the various possible methods of integrating data, not the strong point of the View family. Overview, a Store/Spell/Plot/Index package with enhanced integration for the Master 128 is discussed.

As an occasional user of the View family I found the book a good read and fairly useful.



It is certainly an excellent introduction for newcomers and for the price of a game on disk it will pay back in time saved finding out the tough way.

Two allrounders for all the back-bedroom workers

Home Office review

This month we review Mini Office II, the all-in office that other companies have failed to achieve. At the time of writing it had attained number 25 position in the Gallup chart, up amongst the top selling games. The software which was originated on BBC Micro as Mini

Mini Office on its purpose built board which plugs into just one ROM socket

Office in October 1984 is now available for Amstrad and Commodore 64 as well as in tape, disk and ROM format for the BBC Micro.

The ROM version is the one we decided to review although we also tried the disk, which was acceptably fast in moving between the modules of wordprocessor, database, spreadsheet, graphics, label printing and communications. Tape will, in all likelihood, prove too slow for it to be an efficient proposition over the more usual pen and paper techniques.

First encounter

The users, and reviewer's first encounter is with what proves to be an excellent little manual designed to sit flat beside the computer for reference. There is unfortunately no index but it is so clearly set out in sections according

MINI OFFICE II / VIEW GUIDE

to application that this isn't sorely missed. A function key strip for each module is printed in the manual for (photocopying) cutting out and mounting.

The manual acts as a guide and tutor around each module in turn. The software is a simple hierarchy of menus, the main menu accessing submenus for each module. You can move rapidly between packages via the submenu to the outer menu, saving your current work as you go. It is fair to say that Mini Office II incorporates mouse support rather than being mouse driven, but it is a useful option to have and one underemployed in software generally. Data is swapped by the modules by importing and exporting files onto the storage intermediary, the disk surface. Mini Office owners upgrading to Mini Office II will be glad to see a CONVERT program for their data files.

Wordprocessor

The wordprocessor is at the heart of most 'home offices' and this program copes admirably with the sort of correspondence we put through it. There is plenty of opposition in this and other areas of Mini Office but many will feel these alternatives overpowered for home use.

The range of options is reflected in the twelve item menu: Edit text, Preview text, Print text, Clear text, Search & Replace, Catalogue, Select Mouse, 40 character mode, Merge text, Save text, Load text, Mini Office II Menu.

The top of the editing screen displays time elapsed, words in document and free space. You have full editing, copy, delete, move, search/replace, word count in block, insert/overwrite and colour choice. Text formatting and print and paper handling are both handled by two character mnemonics inserted into the text. The Epson standard is supported by default but there's full defineability of the print driver for variations on the printer theme.

Some commands are especially useful. **GF** gets a file and prints it out. By creating a text file with a series of GF (file) commands in it, you can "batch" print. **GD** gets a database record starting at record nn and combines with **FL n** which inserts field n of the current record. These two commands intelligently interact with database lists for a mailmerge facility which is easier than those possible with View/Database or View/Viewstore where intermediate files have to be created. There are many useful commands, one I especially appreciated halts printing and prompts for a new sheet of paper.

For Master 128 owners the commands **DATE** gets and inserts the date and **CLOCK** gets and inserts the time, both from the internal clock.

Database

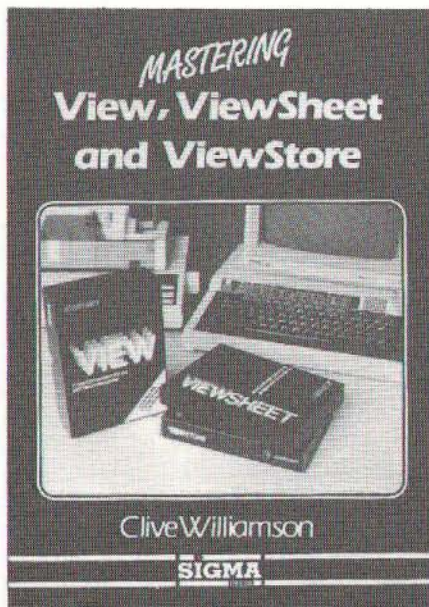
The database is limited in its abilities but gains much from being part of a team. Careful design of the database will pay off if you have a

mailmerge task in mind. The wordprocessor also becomes a formatter/printer driver for the database so that records can be printed in a fully customised manner.

The database is of the type which can only be changed by adding fields or renaming fields. Therefore it is essential to plan the structure before spending time entering data. The manual stresses this point and provides a full example setup session to try out.

The database employs fixed field lengths and types: alpha (called string on screen), decimal, integer, date, and formula. A separate disc is required to contain the data file (or files in multiple file operation). The ROM version overcomes the need for disc swapping. Entering records is slowed down by having to enter N for each new record but otherwise operation is efficient.

The search facility incorporates wildcards, INSTR, =, (,) and (). The sort works on any field and will reorder in ascending or descending order. You can calculate on decimal/integer fields with *total all* and *total marked*. You can also *change all* and *change marked* fields by a constant amount.



Spreadsheet

The spreadsheet size is restricted by memory and combines with its inability to directly enter functions to make it a 'home' spreadsheet rather than one suitable for business.

All the major operations required of a spreadsheet are present, accessed via function key presses, and there is plenty of room for an average "household accounts" sheet for a year.

Absolute and relative duplication will greatly help the creation of your sheet, as will automatic cursor movement when typing in columns and rows of figures. Another nice feature is the ability to run text, labels or notes, over as many cells as you wish. This makes for a readable and understandable spreadsheet on your return to it!

When in use the ability to hold certain cells

in view, wherever you scroll on the sheet, is a simple and useful touch. There is full control over printing although you cannot save a particular print specification with the sheet but must repeat the process on each occasion. Finally you can save a set of up to 20 cells from any row or column as graphics data for the graphics module.

Graphics

The graphics module can handle up to three data samples either read in from one of the other applications or entered manually.

The **bar chart** can be *ordinary*, *side* - the first two data samples or all three - or *stacked* - two or three related values stacked in the same bar.

The **line graph** can be single, double, or a *cumulative* display of related values.

The **pie chart** can be *ordinary*, *emphasised* - with a slice offset - or can incorporate a *symbol table*.

Data entry can be from the keyboard or from a file and *Edit* is always available. A printer symbol and grid icon do what they suggest. Text can be entered only in the bottom window; no labels can be added in the graphics area. You can save screens (CTRL S) and reload (CTRL L) at any time.

Communications

The communications facilities are not all embracing but Mini Office II continues to amaze me at just how much has been included.

The terminal allows quick and easy access to text based communication services such as Telecom Gold (Microlink), One to One and a number of bulletin boards. If the Mini Office II team is no better than its weakest member then this is the one they would have to drop for my money although for electronic mail - the main business use of comms - it performs adequately.

Labels

This module makes one of the most awkward of home office operations very simple. The on screen display of the label saves both time and stationery when designing special label formats. This module completes Mini Office's all round ability to create wordprocessed mailshots.

Conclusions

If your budget is stretched then the disk version of Mini Office 2 is outstanding value and you will find it difficult to come up with an operation it can't cope with. It is a much better bet than any available combination of similar modules on disk. When you consider the ROM version then View, Wordwise, Intersheet and so on come to mind. But, although they are undoubtedly more powerful in their respective fields, you can buy Mini Office II for the price of one of them! With Mini Office II, the whole proved greater than the sum of its parts. Details from Database Publications. Tel: 061 429 8008.

EDNEWS

Education show to change

Dominic Savage, Director of the British Educational Equipment Association recently gave assembled journalists a jolt when he announced that they had been invited to a press conference for the High Technology and Equipment in Education show, under false pretences!

It turned out that what will take place at the traditional time and place (January 20th, Barbican) is British Education and Training Technology '88. The change of name reflects both the drawing together of education and training and the enhanced status of the show. The Secretary of State for Education and Science — whoever he or she now is — is the show patron and there is also a new steering committee with representatives from government, professional organisations, industry and exhibitors. The show sponsors are British Educational Equipment Association and Educational Computing.

Acorn, Apple, Atari and Research Machines are already booked in, together with a host of smaller companies such as 4Mation, Nidd Valley and AB European.

Edsoft club

The Edsoft club are concerned that their members should know how they make selections because that may help them understand what makes a good educational program. What follows is an extract from the club newsletter.

Now that computers have been in schools and homes for a few years there are clearer ideas about how the computer can best supplement traditional education. Educationalists now see the computer as a resource, as books, TV programs or videos are. And each resource helps the learning process in its own way. The computer is one of the most powerful resources when it is well used. Therefore it is a shame to use the computer to do the same as a book or pencil and paper. Ideally we want to use the computer in such a way so that it is a uniquely powerful educational resource.

In the early days, educational programs were full of 'drill and practice', question and answer sessions. For a while this can be motivating for a child because it is a novelty. In addition the feedback is very fast. But it was soon seen that more imaginative developments were possible that are more stretching. In 'drill and practice' the user has to respond to the computer. Either s/he is right or wrong. There is no discussion and no room for imagination. Now programs have been developed that extend the child's (or adult's) thinking skills. The computer is no longer master but the child can be in charge with the computer as helper. So the computer as an aid to creativity is one leading factor in our choice of software. Immediately you may think of 'creativity' as simply 'drawing' and you may want something more 'serious'. Rest assured that creativity can extend skills in English and Mathematics and in general problem solving too.

Problem solving programs

Which brings us to another criterion — problem solving. As far as possible, programs that put the user in a problem situation where there are several stages to work through, will teach more than short questions and answers. Children have a knack of learning by

rote instead of understanding underlying principles. Problem solving is a deeper learning process and the computer is good at setting up suitable situations. It is even better if children can set their own problems within the framework of the program in use. Then they will be more thoroughly involved in finding a solution and the learning accomplished will be greater. Programs like these can be found in many subject areas including English, Maths and even foreign languages.

Subject areas

The subjects in which parents are most concerned that their children progress are usually Maths and English. For this reason the major part of our lists will be based in these areas. But do not for one moment think that that is narrow. A creative program, after all, should stretch to many areas of interest. For example, although a Word Processor is 'based' in general literacy, you can of course just as well write an essay in History or Environmental Studies or write Business correspondence. Similarly, although Logo may help you understand Geometry in the first instance, you could also draw up your Physics experiment or the 'sky at night'.

Apart from general numeracy and literacy, other subjects will creep in from time to time when an imaginative program appears. For example, Computer Literacy is an area that the computer conveys powerfully. This is also an area that parents are often concerned to educate both themselves and their children. So look out for those programs.

An imaginative program can often create a realistic environment for learning foreign languages. It should do more than supply vocabulary tests. For example, it can place you in the street to find your way around or in a restaurant ordering food. If this is accompanied by an audio cassette all the better. These programs too might be suitable for both you and your children.

Campers

Kaskenmoor School Community Computer Camp is taking place again this year in mid August. Details from Mike Humphrey on 681 4116.

Brightest and Biggest

"Brightest and biggest", that's how Fernleaf's Michael Lister describes the educational software house's latest catalogue. As well as already well-known titles, new software is featured, such as Castle under Attack, the Normans: Resources Pack and the educational software selections.

Castle Under Attack is an historical strategy game set in a medieval age for ages 9 to 14 and upwards. Two sides, attackers and defenders, play through a number of sessions and during the course of the game there are opportunities to save the current position. All versions cost £17.95 inclusive, including 3.5" Compact disk. The Player's Information Booklet is also available separately in packs of 10 at £4.95 each.

The 24 page catalogue is free on request. Details from Fernleaf, 31 Old Road West, Gravesend, Kent DA11 0LH. 0474 359037.

Australian show

Continuing last month's international theme, we've discovered a number of educational software companies making headway in Australia. Software is flowing in both directions with companies such as LTS bringing in programs for distribution in the UK. 4Mation have cultivated this market for a number of years with regular visits and an imaginative use of electronic mail to do business. Now Micro-Aid have taken space at the Australian National Computer Exhibition to be held in Melbourne from the 8th to the 10th of September.

Micro-Aid have a long history of supplying both Australia and New Zealand. They will be demonstrating their Family History System which they believe will be popular with genealogists who are fascinated with their ancestral links with the old country particularly with the approaching bi-centennial celebration of the settlements in Australia. Micro-Aid have now added facilities for transferring family data to the Mormon Ancestral File system which is a worldwide standard for managing this type of information.

Micro-Aid would be happy to discuss the promotion of products on their stand with any other interested British companies.

Three dimensional Logo

Two new products will be presented by Logotron at the Acorn User exhibition (July 23-26). 3D Logo is the latest extension (after control and music) for Logotron Logo. Building on conventional turtle graphics, 3D Logo represents a powerful tool for exploring 3D shapes and examining vector and cartesian geometry in 3D space.

The second newcomer is Printworks, a program for producing printed material by mixing text and graphics on the same page. Developed in Australia, the program has been a best seller around the world on various computers.

Domesday floppies

A new floppy disk enhancing the use of the Domesday discs, called Domesday Display, is to be released this autumn. The software allows users to extract data and pictures from the Domesday discs and run them in the form of a 'slideshow'. This is particularly useful for any kind of presentation, lecture or seminar.

Later in the year another floppy will be introduced for users wishing to interface their own data with the maps contained on Domesday's Community disc.

Jean Nunn, Head of Educational Developments at BBC Enterprises, has said that "initial reactions to the AIV system and the Domesday discs have been encouraging. We have received more than 1,000 enquiries each month since the November launch and we're confident that the new Ecodisc and software packages will stimulate even more interest".

As a side note, all the major players in the AIV system will be exhibiting at Interactive '87, the industry show from 1st to 3rd of December this year at the Brighton Metropole.

Farmer Giles

Magnolia Soft have released their Farmer Giles software, which has benefitted from three years of testing and development, originally as part of an Acornsoft project.

Designed for children aged 9 to 12, the software supplements a visit to a farm or county show and encourages children to share their findings with real farmers. Teachers can alter key factors to suit their particular preferences and the program is ideal for group work with up to 10 groups able to participate.

Details from Magnolia Soft, 24 Elliot Close, Exeter, EX4 5ED.



The AIV system with Ecodisc

Interactive Ecodisc

The Domesday Advanced Interactive Video System, Master Turbo and Philips LV ROM, has had its second piece of laser disc software published by BBC Enterprises. The Ecodisc offers a simulation of real-life problem solving in environmental and ecological management. The software is written in BCPL by Roger Moore of the Open University.

The disc simulates the ecology of the Slapton Ley nature reserve in South Devon, bringing together a vast collection of information including 4000 still photographs, 170 film sequences, graphic displays and data. The user is placed in the position of manager of the reserve with the task of drawing up a plan for running Slapton Ley, a wetland habitat and a site of special scientific interest with a diversity of ecological and environmental possibilities.

"The great thing about the Ecodisc is that there are no right or wrong answers", explains Peter Bratt, the Executive Producer, "Users receive reactions on the videodisc from a wide variety of people with an interest in the reserve — everyone from the bird-watcher to the eel-poacher! These people express opinions about the proposed plan for running Slapton, and users can change their plan at any time until they are ready to carry out the final version. Users become intensely involved in the task of running the reserve — for them it becomes a real place. And yet they are discovering and applying ecological facts and concepts. Learning becomes more relevant and meaningful when it is placed in a process-based context as in the Ecodisc."

By way of introduction to the new environment users can watch films, walk around the area, take a boat out on the lake or look down from a helicopter for an aerial view — apparently the cameraman dangling from the helicopter became a local talking point!

Details of the animal and plant life, underwater pictures and microscope photographs are all available for study. A fascinating feature of the material on the disc is that all views are available for both summer and winter and you can flick between the two at the touch of a button.

The Ecodisc has been designed to complement field trips for biology and ecology students with especial consideration for the GCSE ecological studies curriculum.

Peter Bratt believes Ecodisc could have a wider impact. "We are all becoming more aware of the environment in which we live. There is no doubt that

there will be proposals for major changes in rural areas over the next few years. The Ecodisc and other related developments can play a part by informing people and making them better equipped to evaluate changes before they happen."

Price of the Ecodisc and user guide is £169 plus VAT. The first side has the interactive sequences, software and data, the second the BBC Schools Television programme 'Ecology and Conservation'.

Rural Rambles

Softteach have release two packages which let children plan journeys, go rambling and read maps, all on computer.

Rural Rambles and Seaside Strolls are games versions of established educational software. Details from Soft-Teach, Sturgess Farmhouse, Longbridge Deverill, Warminster, Wilts, BA12 7EA. Tel: 0985 40329.

Did you know?

The W.H.Smith Children's Leisure Survey conducted by one of the UK's leading market research companies Millward Brown, took in some 1000 8 to 15 year olds. And guess what? Watching TV is easily the most frequent and popular leisure activity for children and fifty seven percent of children — two thirds girls — read a book on an average day, 88% in an average week.

Fifty nine percent of children have a computer at home, 73% where there are only boys, 44% in homes with only girls. Working class households have 49%, middle class 65%. Fifty percent of boys use a

computer in a week compared with 30% of girls but boys are three times as likely as girls to use them frequently (24% vs 8%).

Those who use a home computer enjoy doing so, with 53% saying they like it a lot, similar to attitudes to listening to music (49%) and above reading books (33%). Whilst usage grows with age amongst boys, it declines amongst girls.

Only 18% of parents consider it important that their children should use computers. The corresponding figure for book reading is 71%. Both sexes tend to see computers as being more for boys than girls and boys see them as something to talk about to their friends and a source of new ideas. Other children do not view children who use a computer in a particularly positive light but they do believe them 'clever' (86%).

Energetic

The British Gas Education Service has two handy software packages for schools, TASK — a program teaching the skills of room design — and CEDRIC 2 — three programs which help pupils study how their homes compare with national and regional averages of energy use.

PROFILE provides facts and figures, DHL (Design Heat Loss) calculates how much energy escapes from the house on a cold winter's day, and GUESTMATOR estimates the quantity and cost for the different purposes in the home.

CEDRIC 2 comes with notes and data forms and costs £8.05. TASK, programmed by the Advisory Unit, costs £11.50.

British Gas Education Service, PO Box 45, Houslow, Middlesex TW4 6NF.

University Software

UNISTAT-II

MARK 2 STATISTICAL PACKAGE

***FULLY INTEGRATED SUITE OF STATISTICAL PROGRAMS * DEDICATED DATA PROCESSOR * AUTOMATED MISSING DATA HANDLING * USER DEFINED LABELS FOR VARIABLES * READING DATA FROM ASCII FILES * DIRECTION OF OUTPUT TO PRINTER OR ASCII FILES * HIGH-RESOLUTION PLOTS * COMPREHENSIVE USER MANUAL**

UNISTAT DATA PROCESSOR: A spreadsheet designed exclusively for data handling. **DATA ENTRY:** Cursor editing, overwrite/insert modes, continuous entry, insertion and deletion of cells, cols and rows, go to, col labels. **FILE HANDLING:** Read, write and merge in internal and ASCII format. **COLUMN TRANSFORMATIONS:** Formulas using cols as variables. Any combination of +, -, *, /, %, LOG, EXP, SQ, ABS, SIN, etc. Operations with col numbers or labels. **STATISTICAL COMMANDS:** SIZE, MIS (no of missing values in a col), SUM, SSQ, MEAN (adjusted for missing values). Single or multi col sorting in asc or desc order. Ranks. **CONDITIONAL FORMULAS:** Selection of cases, creation of dummy and effect vars, recoding, breakdown, etc. Logical operators >, <, =, AND, OR, NOT.

MULTIVARIATE REGRESSION: Simple corr matrix, choice of dep var, selection of indep vars, nonconstant reg. Selection-specific missing data handling. No. of rows and cols omitted due to missing values and multicollinearity. Output includes estimated coeffs, t-stats, std errors, R2, adjusted R2, std error of reg, F-stat, D-W stat, ANOVA of reg, var-covar and multiple corr matrices, interpolation, plot of residuals, plot of actual and fitted y values. Addition of residuals and/or fitted values to data matrix.

STATISTICAL TESTS: Significance levels for most test stats. Test-specific missing value handling. **PARAMETRIC:** One sample t, two sample t with equal and unequal vars, paired t, F, NON PARAMETRIC: Chi-sqr and Kolmogorov-Smirnov, (both with equal and unequal exp freq versions), chi-sqr Bartlett, Mann-Whitney U for small, medium and large samples, Wilcoxon signed rank, Walsh, Wald-Wolfowitz runs, Kruskal-Wallis one-way ANOVA, Friedman pseudo two-way ANOVA, Jonckheere trend, Page's L, Cochran Q, Goodman-Kruskal gamma, Sommer's d. **CORRELATION COEFFICIENTS:** Pearson, Spearman's rho, Kendall's tau, Point biserial,

Goodman-Kruskal gamma, Sommer's d, Yule's Q, phi, tetrachoric. **DISTRIBUTIONS:** Chi-sqr, t, F, Normal (std, non std), log, inverse and bivariate normal, binomial, negative binomial, exponential, hypergeometric, gamma function, Khrgian-Mazin.

DESCRIPTIVE STATISTICS: Analysis of raw data or data with freq counts. Raw data sorted and grouped. Freq dist with choice of lower bounds and class intervals. Absolute, cumulative and relative freq. Histograms, scatter diagrams and time series plots. Output includes sum, mean, mean deviation, median, variance, std deviation, third and fourth moments, skewness, kurtosis, range, etc. **ANALYSIS OF VARIANCE:** One-way with and without repeated measures, two-way with no interaction, two-way and three-way with one, two and without repeated measures.

TABLATIONS: CROSS-TABLATION: Two-way tables with col and row totals and percentages. CHI-SQUARE CONTINGENCY TABLE: Observed freq, exp freq and chi-sqr for each cell. Col and row sums, overall chi-square stat and its significance level. Yates correction.

HIGH RES PLOTS: All plots can be dumped on the printer. **PLOT OF BIVARIATE REGRESSION:** Scatter diagrams with optional line of best fit, intercept, slope, R2, std error. **CURVE FITTING:** Fitting of polynomials on bivariate data. Fitted polynomial coeff, R2 and std error. **TIME SERIES PLOTS:** Simultaneous plotting of up to 7 columns of data against time. **PLOT OF FUNCTIONS:** Simultaneous plotting of up to two functions, integrals, polynomials and roots of polynomials.

DEFAULT SETTINGS (For BBC version): Choice of screen and device control parameters. 40 or 80 column display, number of data drive 0/1/2/3, black & white or colour monitor width of printer, high-res screen dump command, maximum formula length, maximum number of columns and rows depending on free RAM.

LINTPRO Linear/Integer Programming Package.

Written by Dr D. Sprevak

A professional package which can solve very large problems on a 32K BBC micro by means of revised simplex algorithm and efficient vectorisation. It can solve a problem with 82 variables, 60 constraints and 15 upper bounds in 24 minutes. Runs faster on second processor. Plus or Master series. LINTPRO requires minimal prior knowledge of linear programming techniques and is ideal for real applications as well as for teaching purposes. Data entry in Backus-Naur notation. Selection of optimality of solutions between 0% and 100%. Optional printing of intermediary steps and choice of branching strategies. Output includes optimal values of variables, value of objective function, slackness, shadow prices and it can be directed to screen or to a text file.

CPA Critical Path Analysis

Written by Dr J. S. Dean

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NATIVE TONGUE

The range of software available for modern language teaching is testament to the fact that the microcomputer has proved itself valuable in this field. The learning both of grammar and vocabulary is traditionally associated with lists and tests. To varying degrees these have been replaced by more exciting methods



Granville: setting out

Summer school

Granville, the prize holiday package, developed by Homerton College and published by Cambridge University Press, is the most ambitious language learning software I have seen and the most successful. The complete project consists of disk based software and a workbook packed with information, cuttings, worksheets, lots of material to work through at and away from the computer.

At the keyboard is an electronic version of Granville about which the student can move, taking trips, spending money, watching the weather, choosing transport and what to have for lunch. Like on any holiday, events have to be organised; the clock, the cash and the clouds have to be watched closely to add up to an enjoyable time. Granville is nothing if not enjoyable, surely one of the keys to



Granville: what's on today

remembering the quite large vocabulary encountered during your stay. The software is cleverly written, adventure style, by Wac Brodzki and attractively presented on screen.


There are the usual Homerton features for setting up the software, which is compatible with all versions of BBC Micro. The guide contains five worksheets for photocopying, a full word list and a complete guide in words and pictures to the features of Granville. Up to 16 students can register in the Granville hotel for the five day stay and full diaries can be printed out to be taken away. The secondary school target age range is 11 to 16.

Bonjour Henri Beret

Onto a series of AVP Computing software for students of French. These are Henri Beret plays Cricket —

60
50
40
30
20
10

HI-SCORE
m-choice 0
type-in 0
Your Score 70



FILE 23
THE SEASIDE

the spade

1. se	bronzer
2. la	bêche
3. le	seau

ANSWER = 1a bêche
Press ANY KEY

irregular verbs and tense recognition, Henri Beret plays Darts — French vocabulary, Henri Beret au Tir — role play phrases, and Six French Games — around the town, fruit, eating out, school life, free time, months, seasons, weather and countries. There is also Stell mir eine Frage for German students.

These programs are very cost effective when you consider their starting price and the ability to write



Stellen Sie mir eine Frage!

(Fragezeichen!)

Ich kann diese Frage nicht beantworten.

?Wo wohnen Sie?

Ich wohne in Bremen.

?Was ist Ihre Name?

Mein Name ist Petersen.

?

your own lists of vocabulary to be learned. Each of the Henri Beret series is a graphically crude game trying to serve as inspiration for the student to answer a question by directly typing in or from multiple choice. A score is given and the student can revise any wrong choices. The games of darts or cricket will not help a student get the answers right but merely provide a structure for the quiz.

Stell mir eine Frage is an interesting question and answer session with an imaginary character. It is up to the student to find out about this character through intelligent questioning. The categories in which questioning will be fruitful are listed on a worksheet provided with the software so that the student can write down the answers and build up a profile of the

character.

Once again the software has been designed to take user defined content so a teacher can tailor the vocabulary to a student's current abilities. The manuals give full instructions on both the tests and the creation of further vocabulary lists. Special characters are produced on function keys.

There are lots more Henri Beret disks testing regular verbs, adjectives, pronouns, relative clauses, negatives and so on. The series is not ambitious in its intentions or realisation but the software is an effective method of getting across vocabulary and grammatical points.

Tedimen Software

ਜਿਤੁ ਸੋਹਿਲੇ ਸਚਾ ਸੁਖੁ ਹੋਇ ॥੧॥
ਰਹਾਉ ॥ਨਿਤ ਨਿਤ ਜੀਅੜੇ ਸਮਾ
ਲੀਅਨਿ ਦੇਖੇਗਾ ਦੇਵਣਗਾਰੁ ॥
ਤੇਰੇ ਦਾਨੇ ਕੀਮਤਿ ਨਾ ਪਵੈ ਤਿਸੁ
ਚਾਤੇ ਕਵਣੁ ਸੁਮਾਰੁ ॥੨॥ ਸੰਬਤਿਸਾਹਾ
ਲਿਖਿਆ ਮਿਲਿ ਕਰਿ ਪਾਵਹੁ ਤੇਲ
॥ ਦੇਹੁ ਸਜਣ ਅਸੀਸੜੀਆ ਜਿਉ
ਹੋਵੈ ਸਾਹਿਬ ਸਿਉ ਮੇਲੁ ॥੩॥ ਘਰਿ
ਘਰਿ ਏਹੋ ਪਾਹੁਚਾ ਸਚੜੇ ਨਿਤ
ਪਵੈਨਿ ॥ ਸਚਣਗਾਰਾ ਸਿਮਰੀਐ
ਨਾਨਕ ਸੇ ਦਿਹ ਆਵੈਨਿ ॥੪॥੧॥

Folio — Gujarati

Direct approach

BBC Software have done an excellent job in supporting two of the BBC's language programs, *Deutsch Direkt* and *A Vous La France*, with software packages.

The *Deutsch Direkt* programs come on disk with an accompanying audio tape. There is complete concentration on particular groups of vocabulary with regard to meaning and pronunciation. The learning is done in blocks of 15 words. A purpose-built display, a very flexible method of control and different colours for certain types of vocabulary are all very effective.

Tedimen Software

ٹیڈی میں سو فٹو پٹر آتی جا تب سے اکتی ٹی
پیشکش اردو کا ورڈ پر وسیسہ جستی برولت آپ اپنے
بی بی سی کمپیوٹر پروڈر پروڈر پروڈر آدستتے ہیں
یہ اپنی قسم کا پہلا ورڈ پروسیسر ہے اس کی خوبیا
یہ ہیں آتے آپ اس میں الگ الگ زبانیں بھی
استعمال آدستتے ہیں جنہیں گجر | تی پنجا بی
ہندی فرینچ جرمن قابل رتد ہیں آپ اس پیکیج
کی برولت آپتی لکھی ہوئی ٹیکسٹ کی غلطیاں
دور آدستتے ہیں اور نئے الفاظ بھی انسرٹ
آدستتے ہیں .

Folio — Urdu

EDUCATIONAL SOFTWARE

The audio tape is played when prompted from the screen.

The manual deals with how to approach the materials to get the best out of their design and advises on mnemonic techniques. There are a number of 'games' to reinforce the learning of vocabulary. Wordsquare has you searching for words, Links takes you from one word to another along a chain of connections, Clock tests your speed of recognition and topics relates the core vocabulary to specific environments. There is information on how to interpret your results.

As you can gather, Deutsch Direkt is a very planned approach to acquiring and remembering vocabulary. As well as being testing, it is also fun.

A Vous La France takes a slightly different approach. Presented on tape with a tape to disk convertor (quite a fiddly job with a number of files to transfer), the programs work in series. Each individual exercise is run in conjunction with the instructions in the manual. Now and again a revision unit is encountered. There is a huge range of subject matter and approach and the programs are a valuable resource and could be used separately as well as a planned course.

Open ended

As well as specially produced packages, language learning also benefits from open ended aids such as the wordprocessors Folio and Wordpower. Folio's potential for representing languages through its graphics based fonts on the screen of a Model B or Master can be observed from our few examples here. Acorn's Archimedes' natural character set is graphics based and the potential for foreign language wordprocessing and desk top publishing is enormous.

Wordpower's achievement is to get two character sets on screen at the same time, ideal for creating teaching materials. The foreign language character

sets appear both on screen and on printer in a choice of high quality fonts. Ian Copestake Software is offering readers of A&B Computing a discounted Wordpower package through our Reader Services department. Details follow at the end of this article.

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W12 0TT

Cambridge Micro Software
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Shaftesbury Road
Cambridge
CB2 2RU

Tedimen Software
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Software offer

Ian Copestake Software are making a full Wordpower/power font package available only to readers of A&B Computing at the discounted price of £49.90, which includes VAT and postage and packing. All you have to do is fill in the form below, quoting the product number *ROAB8* and send it along to Reader Services, A&B Offer, 9 Hall Road, Marylands Wood Estate, Hemel Hempstead, Herts HP2 7BH. You can also telephone your order for ACCESS or VISA credit cards on 0442 211882.

NAME & ADDRESS

.....
.....
.....

TELEPHONE: DAYTIME EVENING

PRINTER MAKE PRINTER MODEL

CHOICE OF POWER FONT (tick one box):

European Russian Polish etc Greek Mathematics Physics Phonetics
(Others available to special order)

DISC TYPE:

5.25" 3.5" 3"

40-track 80-track

DFS ADFS

DO YOU USE A SECOND PROCESSOR/CO-PROCESSOR? Yes No

IF NOT, DO YOU HAVE SIDEWAYS RAM? Yes No

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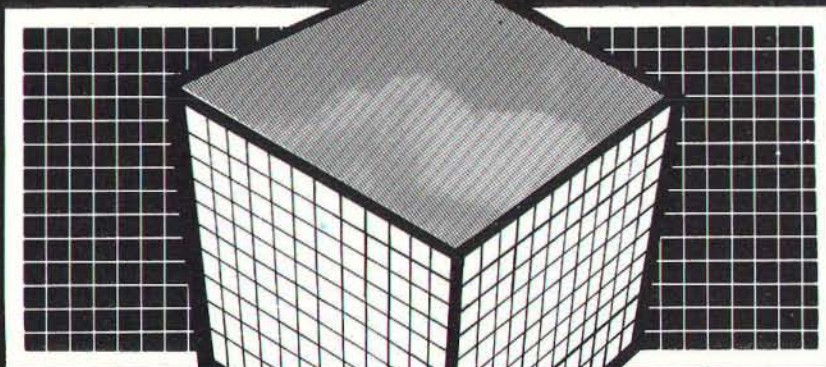


ARM

Assembly language programming

By Peter Cockerell

This book describes in detail all aspects of programming the new Acorn Risc chip (generally referred to as the ARM). This 32-bit chip, on average 4 times faster than a 68000, will form the basis of a new generation of machines. The book explains why the chip is so fast and how to take full advantage of its power.



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- **Data structures.**
- **Non-user modes.**
- **Undefined instructions.**
- **Interrupts and vectors.**

The book is completely up-to-date covering only the new 2 micron ARM, with appendices on the floating point and co-processor instructions and with numerous example programs. A truly comprehensive reference manual for anyone who intends to program in ARM assembly language, or for those who just want to find out why the Acorn RISC chip is so special.

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PLUS TALK

Word games with practical applications

This month's article was inspired by the arrival of Computer Concepts' latest offering, Spell-Master. In case you haven't read Gordon Taylor's detailed review of this super spell checker (A&B, March 1987) the essential details are that it (i) has a huge, 57,000 word dictionary all in ROM, (ii) supports in-memory checking of documents either continuously or retrospectively for Inter-Word, Wordwise (Plus) and View users, (iii) has extremely fast checking speeds, (iv) has its own text editor for editing of user dictionaries, checking of ASCII files created on other wordprocessors etc and (v) provides some handy * commands for access to the dictionary from other languages such as BASIC.

This is a superb piece of software which should sell to many serious users of the BBC Micro, regardless of their preferred word-processing software. The version I received (1.66) was not entirely bug free, however. There is a problem with the load text to cursor option in the editor (unusable on my machine) of which the company were aware and another difficulty on the Master 128 about which I have told them. Doubtless these faults will have been rectified in upgrades by the time you read this, but in case other Master owners are experiencing difficulty, I shall explain the second problem that I have had and how to cope with it. When loading a text file of significant length into Spell-Master's editor, I found that the program crashed the machine entirely, requiring a switch-off to reset. The problem is that the editor selects Mode 0 by default (Mode 7 can be chosen) but unlike all Computer Concepts' other main ROMs does not automatically select shadow RAM.

If the file loaded is consequently too large for the screen mode, the program fails to trap the error (at least on the Master 128) and crashes the machine. In attempting to solve this, I discovered that one cannot apparently select *SHADOW as a start-up option in CMOS RAM. If you choose a shadow Mode by *CONFIGURE (eg Mode 131) this doesn't have the required effect. *SPELL issues the machine code equivalent of 'Mode 7' which switches to the non-shadow mode. The only solution that I have found is to type

*SHADOW before calling the editor with *SPELL.

Although you need not call the editor for normal use of the spell checker (if using one of the supported word processors), it has a very neat use, not clearly identified in the manual which I will discuss in detail in this article. It enables you to derive extremely quickly an alphabetically sorted list of all the words used in a piece of text, with all duplicates removed. I will present one utility written in BASIC which exploits this to facilitate the quick development of your own specialist dictionaries regardless of which word processor you use. For Wordwise Plus owners, I will present a segment program to develop the word list into a formatted document with full frequency counts. First, though, I must explain how to obtain the basic word list.

Extracting word lists from Spell Master

Computer Concepts have rejected the use of disc based user dictionaries on the grounds of speed, so you can only add your own words if you have sideways RAM fitted. Of course, this is standard on the B+ 128 and Master series machines and has been one of the most popular upgrades for the Model B. Two of the options provided on the *SPELL menu are provided for installing and editing user dictionaries in sideways RAM. You must first create a blank dictionary by installing an empty file from the editor and then save it to disc by *DSAVE. *DLOADing the dictionary back before use of Spell-Master will allow you to use the 'add to dictionary' option when spell checking. The

```
Tomorrow, and tomorrow, and tomorrow,
Creeps in this petty pace from day to day,
To the last syllable of recorded time;
And all our yesterdays have lighted fools
The way to dusty death.
```

Filename: MACBETH

ALL	1	AND	3
AND	3	TO	3
CREEPS	1	TOMORROW	3
DAY	2	DAY	2
DEATH	1	THE	2
DUSTY	1	ALL	1
FOOLS	1	CREEPS	1
FROM	1	DEATH	1
HAVE	1	DUSTY	1
IN	1	FOOLS	1
LAST	1	FROM	1
LIGHTED	1	HAVE	1
OF	1	IN	1
OUR	1	LAST	1
PACE	1	LIGHTED	1
PETTY	1	OF	1
RECORDED	1	OUR	1
SYLLABLE	1	PACE	1
THE	2	PETTY	1
THIS	1	RECORDED	1
TIME	1	SYLLABLE	1
TO	3	THIS	1
TOMORROW	3	TIME	1
WAY	1	WAY	1
YESTERDAYS	1	YESTERDAYS	1

Figure 1

PLUS TALK SPELLMASTER UTILITIES

Spell-Master editor can be used to edit such a user dictionary which is copied across from sideways RAM for deletion and addition of words and then re-installed by the appropriate menu option. In the process any duplicate words are stripped and the edited list is re-sorted alphabetically.

This latter facility can be exploited for an entirely different purpose with which I am concerned here. If you create a pure ASCII file of less than 16K by SPOOLing text from your wordprocessor, an alphabetical word list can be produced by the following procedure:

(i) load the spooled file into the Spell Master editor

(ii) install it as a 'user dictionary' into a specified sideways RAM bank

(iii) read contents of the 'dictionary' back by choosing the edit dictionary option.

In the process of transferring a spooled, but otherwise standard text file, Spell-Master will transform it into an alphabetically sorted list of the words used with all duplicate words, punctuation, and non-alphabetic characters removed. The astonishing thing is that even with a large text file this massive amount of text processing is achieved in no more than a few seconds. Note that the word list should now be saved as a text file from the editor's menu and *not* by *DSAVE as though it were really a dictionary.

What if you require a word list for a text file over 16K? This can be achieved in the following way. First of all, divide your file into sections of under 16K and SPOOL each separately. Then load each into Spell-Master, create and save word list files as described above. Next, merge all the word list files into one. You will have plenty of room because each will be much shorter than the original text file from which it is created. The merged file will, of course, be out of sequence and contain duplicate words. No problem, just load the merged file in Spell-Master's editor, move it in and out of sideways RAM as a user dictionary and you end up with one correctly ordered and non-duplicated list of words from your large document. By this technique it may be possible to create word lists from multi-file or second processor documents whose total length far exceeds the machine's normal RAM capacity.

User dictionaries

Many users will have specialised vocabularies or jargon words which they could not reasonably expect to find in the Spell-Master ROM and so will need to develop real user dictionaries to be held in sideways RAM as an extension of the ROM. Normally, this is done by using the 'add to dictionary' option when Spell-Master flags a correctly spelt word that it does not know. However, it would be nice to find a quicker way of starting your dictionary off, especially if like me you have lots of text files sitting on your discs with examples of your peculiar vocabulary in them. The BASIC program, CHECKER, shown in Listing 1 is designed to assist with this and illustrates

◆ LISTING 1 ◆

```
L.
  SREM "CHECKER"
  10REM Program to read word list file
  20REM created by Spell-Master and
  30REM eliminate words held in SM ROM
  40REM
  50REM Jonathan Evans, March 1986
  60:
  70ON ERROR IF LX<3 THEN PROCshort:GOTO 110 ELSE IF ERR=16 THEN PROCblank:GOTO
  110 ELSE IF ERR=1 PRINT word#;" - unknown":GOTO 110 ELSE PROCerror
  80MODE7
  90INPUT"Enter name of words file "file#
  100FX=OPENUP(file#):REM OPENIN for BASIC 1 users
  110REM Start of check
  120CX=BGETEF%
  130IF CX<13 THEN PROCword
  140IF EOFEF% THEN PROCend
  150GOTO 110
  160:
  170DEFPROCword
  180IF EOFEF% THEN PROCend
  190word#=CHR$(CX)
  200REPEAT
  210CX=BGETEF%
  220IF CX<13 THEN word#=word#+CHR$(CX)
  230UNTIL CX=13 OR EOFEF%
  240LX=LEN(word#)
  250$&900="CHECK "+word#;X%=0:Y%=&9:CALL &FFF7:REM DSCLI
  260ERROR
  270ENDPROC
  280:
  290DEFPROCblank
  300IF LX>2 THEN PRINT "known"
  310IF EOFEF% AND CX<13 THEN M%=L% ELSE M%=L%+1
  320PTRF% = PTRF% - M%
  330FOR I%=1 TO L%:BPUTEF%,32:NEXT I%
  340ENDPROC
  350:
  360DEFPROCerror
  370ON ERROR OFF
  380CLS
  390REPORT
  400PRINT " at line ";ERL
  410PROCend
  420:
  430DEFPROCend
  440CLOSEEO
  450END
  460:
  470DEFPROCshort
  480PRINT word#;" - too short"
  490PROCblank
  500ENDPROC
```

the general technique for accessing the dictionary within another language by use of the *CHECK command.

First of all, put your obscure texts through the procedure described above in order to obtain alphabetical lists of all the words they contain, saved from the Spell-Master menu as an ordinary text file (as opposed to the sideways RAM image created by *DSAVE). Most of these words will, of course, be common words that will already be held in the main ROM dictionary, so it would be wasteful to install the whole list as your working user dictionary. What CHECKER does is to read the file of words and to remove ones already known to Spell-Master. When run, the program asks you to enter the name of the word list file. Any words already in the ROM are replaced by blanks. The program also adopts the Spell-Master convention of eliminating all words less than three characters in length. When the altered file is loaded back into the Spell-Master editor it looks rather silly, with many blank lines and only a few words remaining — the ones required for your dictionary. However, as soon as you install the text as a dictionary, Spell-Master strips out all the blanks as you will see if you read it back by the edit dictionary option.

It is a good idea to keep your dictionaries saved in text form (as saved from Spell-Master's editor's menu) as well as in sideways RAM form as created by *DSAVE. A new list of words created by CHECKER can be merged with the previous text version of your dictionary via a word processor and then loaded into the Spell Master editor and installed as your new dictionary. Of course, duplicate words in the merger are stripped automatically in the process.

For the benefit of the programmers amongst you some comments on the workings of CHECKER may be helpful. Firstly, you cannot read the words by INPUT% since they were created as a text file without BASIC's special file format. The solution is to read them byte by byte via BGET%, building up the word in a string variable and checking for ASCII code 13 (carriage return) to detect the end of a word. To find out whether a word is in the Spell-Master ROM you must use *CHECK in combination with ON ERROR. The trick is that when a word is not found, Spell-Master generates an error which returns the value 1 in BASIC's pseudovisible ERR. However, ERR

C O N T I N U E S ►

PLUS TALK SPELLMASTER UTILITIES

is not updated until another error occurs. In the program, if a word is not found at line 250 then the ON ERROR routine is activated with ERR set to 1. If the word is found, then line 260 deliberately generates a 'syntax error' to activate ON ERROR with ERR set to 16, so that the IF command can be used to select the appropriate action. Note that ON ERROR clears the procedure calling and loop stacks so that control may not be returned with a procedure or control structure. Consequently, the ugly looking GOTOs are unavoidable when using this technique.

Frequency counts

A very useful idea for a text processing program is to produce a frequency count of all the words in a file. This may be required for linguistic analysis, or more commonly as preparation for the choice of a word list for indexing purposes, for which software is already available for Wordwise Plus (and at extra cost, View) users. I had been planning to write something along these lines in Wordwise Plus for some time, but was aware that it would be painfully slow to run. However, with Spell-Master to perform half the work at lightning speed, I decided to write a segment utility to do the rest — albeit at a much more sedate pace!

In order to use the program LEXICON (Listing 2), you must have a disc system on

which reside

(a) the main text file itself (which need not be in a spooled form) and

(b) an alphabetical word list extracted from the file by Spell-Master as described earlier. LEXICON can be loaded into any Wordwise Plus segment except 5 and 6 which are used for storing text when the program runs. On running the program, you will be asked to enter the name of both files, after which everything happens automatically. Eventually, you end up with a Wordwise Plus file in the main text area which can be printed out to show word frequency lists by both alphabetical and frequency orders in parallel columns as shown in the brief example in Figure 1. Because the program takes some time to run on a text file of any size, it outputs various things to the screen to let the user know that it is working and the stage of processing reached.

For those interested in the process as well as the result, the actions performed by each of the main procedures of LEXICON are as follows:

PROCprocess-text Accepts the names of the two files from the user. Reads the text file byte by byte and places characters in the main text by use of the TYPE command. Lower case letters are converted to upper case and non-alphabetic characters are replaced by spaces.

PROCfreqcount Loads the word list into segment 5 and then counts for each word in

turn the number of occurrences in the text held in the main text area by repeated use of the FIND command. Sound is switched off temporarily by *F210,1 to avoid irritatingly frequent beeps caused by use of EOT (end of text) condition. The frequencies are inserted into segment 5 beneath the relevant words.

PROCfreqsort Deletes the text in the main text area which is no longer needed and then copies (via the disc) segment 5's frequency list into segment 6. Segment 6 is now sorted into frequency order (highest to lowest) by a technique similar to that of Computer Concepts' supplied utility NAMSORT.

PROCformat Alternately reads the words and frequencies from segments 5 and 6 and TYPEs them into the main text area separated by tab codes. Data are deleted from segments after transfer to save memory space and increase processing speed. The final frequency count document is now in main memory ready for saving or printing.

This utility shows the virtue of retaining your Wordwise Plus even if you have moved over to Inter-Word or View for your main word processing, as I have advised before. The programming language provides unique facilities for the manipulation of text in both conventional word processing and alternative applications. Finally, I hope that an irritated fellow contributor to this magazine will note that I have made several references to users of the View word processor in this article without one unkind remark about their curious habit!

◆ LISTING 2 ◆

```

REM "LEXICON"
REM Reads text file and word list
REM file (created by use of Spell-
REM Master). Creates document in
REM main text area with word frequency
REM counts in both alphabetical and
REM frequency orders

REM Takes a while to run!

REM Jonathan Evans
REM March 1987

PROCprocess-text
PROCfreqcount
PROCfreqsort
PROCformat
DISPLAY
END

*****

.process-text

REM inputs file names and creates
REM processed file in main text area

SELECT TEXT
DELETE TEXT
PROCFfile

PRINT
PRINT "Processing file"
PRINT

C%=0
REPEAT
  C%=C%+1
  L%=BGETI%G%
  IF L%<65 THEN L%=32
  IF L%>90 AND L%<97 THEN L%=" "
  IF L%>96 AND L%<123 THEN L%=L%-32
  L%=CHR$(L%)
  IF C%=39 THEN PROCnewline
  TYPE L%
  PRINT L%;
UNTIL EOF%G%

```

```

CLOSE %G%
TYPE " "

ENDPROC

.file
CLS
PRINT
PRINT "Enter name of text file ";
G$=GLK$
PRINT
PRINT "Enter name of word list file ";
M$=GLK$
G%=OPENIN(G$)
ENDPROC

.newline
C%=0
PRINT
ENDPROC

*****

.freqcount

REM Counts frequency of words in text
REM and inserts them into
REM wordlist in segment 5

SELECT SEGMENT 5
LOAD TEXT M$
*FX210,1
PROCCleanlist
CURSOR TOP
CLS

REPEAT
  S$=GLT$
  PRINT S$
  S$=S$+" "
  SELECT TEXT
  CURSOR TOP
  C%=0

  REPEAT
    FIND S$
    CURSOR RIGHT

```

```

  C%=C%+1
  UNTIL EOT
  C%=C%-1

  SELECT SEGMENT 5
  TYPE STR$(C%)
  PRINT C%
  TYPE ":R"

  UNTIL BOT

*FX210,0

ENDPROC

.cleanlist
REM ADJUSTS BLANK LINES AND
REM AND APOSTROPHE ENDINGS

SELECT SEGMENT 5
CURSOR BOTTOM
TYPE ":R"

CURSOR TOP
REPEAT
  G%=ASC(GCT%)
  IF G%=13 THEN DELETE LEFT
  UNTIL G%>13
  CURSOR TOP
  REPEAT
    REPLACE "'S",""
  UNTIL EOT
  CURSOR TOP
  REPEAT
    REPLACE "'",""
  UNTIL EOT
  CURSOR TOP
ENDPROC

*****

.freqsort

REM Sorts word count list by
REM order of frequency and inserts
REM sorted list in segment 6

SELECT TEXT
DELETE TEXT

```


PLUS TALK SPELLMASTER UTILITIES

```

REM Copy list into segment 6
SELECT SEGMENT 5
SAVE TEXT "FTEMP"
SELECT SEGMENT 6
LOAD TEXT "FTEMP"

REM Count words
CLS
PRINT "Counting words... ";
X%=0
CURSOR TOP
REPEAT
  WS=GLTS
  CS=GLTS
  X%=X%+1
UNTIL BOT
PRINT X%
PRINT

PRINT "Sorting words"
Y%=X%
PRINT

REM Start of main sort loop
REPEAT

REM Make first word count largest
REM so far
CURSOR TOP
WS=GLTS
C%=VAL(GLTS)
S%=C%

REM S% = highest word count so far
REM C% = count for current word
REM Y% = length of list to be searched
REM L% = word number with largest count
REM Z% = current word number

L%=1
Z%=0
CURSOR TOP
REPEAT

Z%=Z%+1
WS=GLTS
C%=VAL(GLTS)
IF C%>S% THEN PROChigher
UNTIL Z%=Y%

REM Find largest word count, mark
REM and move to bottom of text
CURSOR TOP
IF L% = 1 THEN GOTO movedown
K%=0
DO THIS
  WS=GLTS
  CS=GLTS
  TIMES L%-1

.movedown
CURSOR AT 0
FKEY 3
CURSOR DOWN 2
CURSOR AT 0
FKEY 3
CURSOR BOTTOM
FKEY 8
PRINT ". ";
PRINT Y%

Y%=Y%-1

REM End of main sort loop
UNTIL Y%=0

ENDPROC

.higher
S%=C%
L%=Z%
ENDPROC

*****

.format

REM Reads word lists in segments 5
REM and 6 and creates formatted
REM document in main text area

CLS
PRINT "Creating output file"
PRINT

SELECT TEXT
CURSOR TOP

TYPE":GEP:GLM5:R"
TYPE":GDT20,35,55:R"
TYPE "Filename: "
TYPE GS
TYPE":R:R:R"

DO THIS
  Y%=Y%+1
  SELECT SEGMENT 5
  PROCgetnext
  XS=WS
  DS=CS
  SELECT SEGMENT 6
  PROCgetnext
  SELECT TEXT
  TYPE XS
  TYPE ":T"
  TYPE DS
  TYPE ":T"
  TYPE WS
  TYPE ":T"
  TYPE CS
  TYPE ":R"
  PRINT ". ";
  TIMES X%
  TYPE ":GBP"

ENDPROC

.getnext
WS=GLTS
CS=GLTS
CURSOR TOP
CURSOR AT 0
FKEY 3
CURSOR DOWN 2
CURSOR AT 0
FKEY 3
FKEY 7
ENDPROC

```

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LOGO ALIVE

In this article, I will be continuing my discussion of programming in Logotron LOGO, with particular reference to the use of its list processing facilities introduced in my article in the May 1987 issue of A&B. In addition to using the list processing primitives built into the ROM, I shall also discuss the use of the extension module provided on the systems disc which may be installed to provide the additional commands shown in Table 1. First, though, I present a short program which runs without need for the extensions.

Names game

The program NAMES (Listing 1) is actually a rewrite of one that I originally wrote in BASIC a few years ago, though it is much easier to code in LOGO. The program interacts with the user to set a puzzle which can be extremely baffling. A fragment of a typical interaction is shown in Figure 1. The user must keep typing in names to which the computer will respond that it either likes or doesn't like the person concerned. The object of the game is to discover the rule used by the program (systematic with no random aspect). When you think you know, you type TEST and the program asks you to classify a list of names. Only if you get them all right (with no feedback on individual names) are you considered to have passed. The logical nature of the rule to be discovered has been shown by psychological research to be exceptionally difficult to find, even though it is quite simply defined. This short program should provide quite a lot of fun, especially when inflicted on friends and colleagues who pride themselves on their intelligence. One of my research students that I tried it on (in its BASIC incarnation) actually insisted that there was no rule and that the program must have a bug in it!

NAMES makes use of list processing in several ways. For example, the test routine presents each name in turn from the list TESTNAMES and builds a list of the sequence of Y and N responses given by the user. This list is compared with the correct sequence stored in the variable CORANS to check whether the test has been passed.

The easiest way to type in a LOGO program, such as those listed in this article, is via a wordprocessor, since Logotron LOGO stores its program files as pure ASCII. A text editor, such as the Master 128's EDIT is ideal, although Wordwise (Plus) and View are also both suitable provided that you do not include any embedded commands or rulers. I mentioned in my previous article that Inter-Word was not suitable but did not explain why. The problem is that all its files include non-

standard codes. Spooling text from Inter-Word (with paging switched off) *does* create ASCII files (eg for simple !BOOT files) but can only be used to create files readable by LOGO if none of the program lines exceeds the width of the ruler used.

If you type your program in as a text file and save it, say as NAMES (Listing 1), then you can load it by *LOGO followed by LOAD "NAMES. To test run the program you must then type in the name of the highest level procedure which may appear anywhere in the listing, and in this case is again called NAMES. If the program crashes due to typing errors then LOGO will identify the offending

Discovering list processing

procedure, which can be edited by ED (procedure name) and checked against the published listing. If you have LOGO but no suitable word processor, then you can of course, type in the program directly to LOGO's editor, though you may well need to extend its size first by use of the system command .SETEDITOR. Although the editor is less sophisticated than a proper word processor, the advantage of this method is that you can test run the program straight away on leaving the editor.

Utility procedures

Most BASIC programmers start out intending

to build and use procedure libraries to prevent the need to keep rewriting standard utilities. However, most give up bothering because there is no simple way of merging such library procedures without SPOOLing your program as a text file, merging and *EXECING back. Even if you have one of the commercial procedure library management packages, you may feel as I do that they are not worth the effort. In LOGO, however, the use of procedure libraries is much simpler, especially if you are on ADFS and do not have to worry about the accumulation of lots of small files. The point is that the LOAD command (unless preceded by ERALL) will load the file from disc and merge it with the program in memory automatically. Hence, all you need do is to store your utilities in a dedicated directory and LOAD them into current programs as needed.

There are several candidates for such utility procedures contained in the current listings. For example, in Listing 1 I needed a simplified equivalent of BASIC's INSTR command to check whether a word contained a given letter or not. I decided to make it a simple Boolean function, ie with true or false rather than character position output, and used the ? suffix to accord with the LOGO convention for such functions. Note that INSTR? takes advantage of the very useful LOGO facility for applying list processing commands to words, which are then treated as lists of their constituent letters.

Listing 2 presents a utility for sorting a list into random order, but requires the use of one of the commands provided by the list processing extension utility shown in Table 1, namely REMOVE. The procedure RANLIST requires two others, RAHCHOICE and RLIST to work. The main work is done by the

TABLE 1

List processing extensions provided by Logtron disc module uLISTS

DELETE obj1 obj2	Outputs obj2 (word or list) with every occurrence of obj1 (character or word) deleted
DEFINE list	Creates a procedure from a list
ELIMINATE n list	Outputs list with nth item deleted
GPROP name prop	Retrieves value of property associated with name
INSERT obj1 n obj2	Inserts obj1 at position n in obj2 (word or list)
LOCAL variable	Makes variable local to procedure
PLIST name	Outputs list of properties and values associated with a name
PPROP name prop value	Attaches value of specified property to a name
PPS	Displays all property lists and associated names
REMOVE obj1 obj2	As DELETE but removes only first occurrence of obj1
REMPROP name prop	Removes property value associated with name
REPLACE obj1 obj2 obj3	Replaces first appearance of obj1 with obj2 in obj3 (word or list)
TEXT procedure	Turns procedure into list. Opposite of DEFINE

Figure 1

```

If you type in the names of people
I will tell you whether or not I
like them. When you think you know
the rule that I am using type TEST
To give up type QUIT

Give me a name
MARK
Yes I like MARK

Give me a name
FIONA
Yes I like FIONA

Give me a name
PETER
Yes I like PETER

Give me a name
JONATHAN
No I don't like JONATHAN

Give me a name
ROGER
No I don't like ROGER

Give me a name
HARRY
Yes I like HARRY
    
```

recursive procedure RLIST which checks if its input (local) list, LIST, is empty (to terminate recursion) and if not calls RANCHOICE to choose one of the elements at random. This element is added to the (global) list NEWLIST and then REMOVED from LIST prior to a recursive call to RLIST. Note that RANLIST uses OP to return the value of the sorted list, and thus must be treated as a function by the procedure which calls it. Incidentally, this procedure utilises the same concept of sampling without replacement explained in my article on randomisation in a recent issue of the magazine, but is simpler to conceptualise (if slower to run) than the BASIC routine presented there.

The program to be discussed below, shown in Listing 3, also contains a set of utilities which do not, in themselves, require installation of the list processing modules to work. Text is printed from lists in Logotron LOGO, but the language does not appear to have any 'pretty print' facility, so that words will be split across lines when long lists are printed on the screen. The procedures PRLINE, PRP2 and PRP constitute a utility module to provide such a facility and can be saved as a separate file in your utilities directory (eg using the "saved marked section" option from a word processor). When present, using PRP (list) instead of PR (list) will produce wordwrapped text as in the program's listing of birds that it knows shown in Figure 3.

Extended list processing commands

Table 1 shows the extensions provided by the uLISTS module which is provided on the Logotron standard utility disc. This can be installed by the command USE uLISTS, or else by INSTALL iLISTS if another module such as uFIX is already in place. Once installed, these modules effectively extend the language, providing extra primitives for your program commands.

One set of extra commands involves the deletion and/or replacement of items from existing lists. DELETE removes each occurrence of a specified object from a list, whereas REMOVE only removes the first it finds (which is why it was preferred in Listing 2). REPLACE replaces the first object it finds with the new object specified. To replace all occurrences of a given word in a list requires a specially written recursive procedure, REPLACE+ALL, which is shown in Figure 2, together with a demonstration of its effect compared with that of REPLACE.

REPLACE+ALL first checks if the object to be replaced still exists in the list (the terminating condition for the recursion) and if not outputs the current value of the list. Otherwise, REPLACE is used to replace the first occurrence and recursive call is made to REPLACE+ALL with the new value of the list. Note that this call is made via use of OP (for output). The reason for this is that OP outputs a value to the calling procedure, including itself at the previous level of recursion. Hence, when the terminating condition is reached, the final value of the list must be passed up through each level via OP until it reaches the procedure which called REPLACE+ALL in the first place. As I mentioned in my earlier article, LOGO does not permit iteration (repeat loops etc), so you have to get to grips with recursive techniques if you are going to write in this language.

Figure 2

```

?POALL
TO REPLACE_ALL :O1 :O2 :LIST
IF NOT MEMBER? :O1 :LIST [OP :LIST]
MAKE "LIST REPLACE :O1 :O2 :LIST
OP REPLACE_ALL :O1 :O2 :LIST
END

MAKE "LETTERS [A B A C A A D E F A]

?PR :LETTERS
A B A C A A D E F A
?PR REPLACE "A "X :LETTERS
X B A C A A D E F A
?PR REPLACE_ALL "A "X :LETTERS
X B X C X X D E F X
    
```

It should be noted that all of these procedures operate as *functions*, outputting values, even though they sound like commands. For example, if the variable WORD has the value "CART" then you might expect the line: REMOVE "R :WORD to remove the letter R and set the value of WORD to CAT. Instead, LOGO will reply "YOU DON'T SAY WHAT TO DO WITH CAT". The effect required is achieved by: MAKE "WORD REMOVE "R :WORD.

Other extensions provided by uLISTS (cf Table 1) include a useful LOCAL command which works as in BASIC. Also, as in BBC BASIC any variables specified in the argument list are automatically LOCALed (necessary for recursion). DEFINE and TEXT are used to convert text into procedures and vice versa, the utility of which I have yet to divine. The remaining primitives are all concerned with the creation and manipulation of property lists.

Property lists are an extremely useful

facility. Any word may have associated with it a number of properties. These are assigned by PPROP — eg PPROP "MARK "JOB "EDITOR, and retrieved by GPROP, eg PR "MARK "JOB will print "EDITOR". Properties are deleted by REMPROP as in REMPROP "MARK "JOB (just kidding, Mark). Note that PPROP and REMPROP are commands, but GPROP is a function. Property lists are attached to words but do not give them values and are not displayed by POALL or shown in the editor. However, they are stored in ASCII format in the file and appear as shown in Listing 3 when this is loaded into a word processor. To see all the PPROP definitions from within LOGO you type PPS. To see the property list associated with a given name type PLIST followed by the name. For example, in a database of magazines PR PLIST A&B might show: (NATURE COMPUTING SPECIALISM BBC PERIOD MONTHLY). Note that the property lists simply consists of alternate names and values of properties. Because PLIST is a function, however, it is possible to access its value from within a program in order to check whether a given property is associated with a name — a facility which is exploited in Listing 3 to be discussed below.

The obvious application of property lists is for the creation and manipulation of databases in which properties may be regarded as corresponding to the various 'fields' associated with a record. However, the flexibility of list structures means that the information associated with different names may differ with regard to the number and nature of properties and the length of the values without any memory penalty as in an orthodox database. LOGO property lists (as in the parent language LISP) are really designed for storing knowledge in the flexible manner required for many applications in computer modelling and artificial intelligence, rather than for conventional database applications.

An example of how LOGO property lists could assist in the ease and clarity of programming could arise in adventure game programming. For example, the objects in adventure games normally have several different properties attached to them such as LOCATION, CARRY STATUS (can be carried, is being worn etc) DESCRIPTION and in some cases WEIGHT etc. If created as property lists, the values of objects can be looked up by GPROP as appropriate — eg "IF NOT EQUAL? GPROP :OBJECT "LOCATION :CURRENTLOC (PR SE (I can't see) GPROP :OBJECT "DESCRIPTION). List processing is actually well suited to the writing of Adventure games and I hope to examine the usage of LOGO for this purpose in a later article.

The BIRDS database

In order to illustrate the use of property lists in Logotron LOGO, I have written a simple database program called BIRDS (Listing 3). The

C O N T I N U E S ►

Figure 3

```

BIRDS DATABASE
-----
1. LOOK UP BIRDS
2. ADD / REPLACE DATA
3. SAVE DATABASE
4. QUIT PROGRAM

ENTER CHOICE :1

BIRDS gives list of all birds known to
the program
QUIT returns to menu

Give me a bird's name
BIRDS

I know facts about the following birds:

ROBIN CHAFFINCH PENGUIN DUCK EAGLE
OSTRICH JAY FLAMINGO GANNET CHICKEN
MOCKINGBIRD SWAN THRUSH PIGEON

Give me a bird's name
FLAMINGO

FACTS ABOUT THE FLAMINGO

FLIES: YES
SINGS: NO
SWIMS: NO
FOUND IN UK: NO

Give me a bird's name
CHAFFINCH

FACTS ABOUT THE CHAFFINCH

FLIES: YES
SINGS: YES
SWIMS: NO
FOUND IN UK: YES

Give me a bird's name
EAGLE

FACTS ABOUT THE EAGLE

FLIES: YES
SINGS: NO
SWIMS: NO
FOUND IN UK: YES
    
```

top level procedure to be called after LOADING in order to run the program is itself called BIRDS. The program allows the user to enter the name of a given bird and get a display of information that the program knows about it (see Figure 3 for a sample interaction). An option to add data allows one quite simply to extend the database indefinitely (within the limits of memory). If data on a bird are incorrect, then the same option will automatically replace them by entering data for the same name. It should be quite simple to adapt the program by altering or adding to the fields used, or by changing it to apply to an entirely different subject. It is, however, first necessary to understand the manner in which the program makes use of a prototype property list as described below.

The program listing reflects the lack of distinction between program code and data made by LOGO. You think of a LOGO program as a database of things which the system knows. LOGO knows about three types of things:

- (i) procedures, delimited by TO...END
- (ii) variables, defined by MAKE and
- (iii) properties attached to names, defined by the PPROP commands.

In BASIC, the value of variables defined in running a program are stored dynamically and quite separately from the program; they are lost as soon as you edit the program and are

not resaved with it. Any computed values which need to be retained must hence be written by the program into a datafile. By contrast, in LOGO, any variables or properties defined while the program is running are simply added to the database of things LOGO knows, and can be resaved with the program by the SAVE command.

This facility is exploited in the BIRDS program which provides an option for adding new birds to the database. When the program is resaved, the additional data are resaved with it. Hence, to acquire the program as shown in Listing 3, you don't actually need to type in explicitly all the PPROP commands shown, but can create these more simply via menu option 2, before resaving the program plus additional data via option 3. You must, however, provide data for at least one bird from the listing shown, so that the value of the variable BIRDS is defined at the outset with at least one member in its list.

You may be wondering why some birds are apparently assigned more properties than others in Listing 3. In fact, when menu option 1 is taken, you are shown for any bird chosen, its value on four properties: FLIES, SINGS, SWIMS, FOUND IN UK. The program is designed to illustrate a database method used in some artificial intelligence programs in which properties are 'inherited' from superordinate concepts. Most birds fly, for example, so it is clearly very inefficient for a computer (or the human brain) to associate this information with every bird about which knowledge is held. However, not all birds fly, so the system must be able to cope with exceptions. What I have actually done in this program is to define a *prototype* property list associated with the name BIRDS. This defines values of the four properties which I assume will be most typical for the set of birds to be considered, ie they do fly, do not sing, do not swim and are found in the UK. Each individual bird is first assigned a dummy entry, eg PPROP "THRUSH "BIRD "YES which is never accessed, but included to ensure that each bird has a non-empty property list (an empty one would crash the program). Apart from this, birds are only assigned property values if they differ from the prototype — for example, DUCK requires PPROP "SWIMS "YES.

Some brief comments on the techniques used in the BIRDS program might be helpful to those learning the language. When option 1 is chosen from the menu, the procedure LOOKUP requests the bird's name checking first that it is not a special command (QUIT — which returns to menu or BIRDS which produces a list of all birds known to the program). It then tests whether the name entered is a known bird by checking for membership of the list BIRDS. If it is known, then the procedures FACTS and FINDPROP print out the known values.

FINDPROP is a function which returns the specific property value if it exists and the prototype value otherwise. How can you tell that a property has been defined, though? The program uses the system function PLIST to return the property list associated with the bird and then checks whether the property

name under consideration is a member of the list. This method should be reliable provided that the value entered for a property cannot be the same as a property name.

When entering data, the procedure ADD assembles the user's entries in temporary variables (NAME, ANSWERS) which may be checked and verified by the user. The procedure UPDATE (and its sub-procedure UPDPPROPS) then updates the database. This has to allow for both replacement of existing data and addition of new birds. For example, the bird name is only added to the list of names if it is not already a member of that list. When updating properties in UPDPPROPS, a check is first made as to whether the value matches that in the prototype. Only if it does not match is the PPROP command used to associate the value with the new bird. Although PPROP automatically overwrites any previously entered property value, we must also allow for editing of data where a bird has incorrectly been assigned a non-prototype value earlier. Hence, a check is also made for the case where the entry does match the prototype but a listing of the property is nonetheless present for the bird in question, in which case REMPROP is used to remove it.

About this column

In this article, and the previous one, I have covered the basic list processing facilities of the Logotron versions of the LOGO language both in the ROM and making use of the uLISTS extension module. I have not been attempting to teach the language from scratch, but have assumed that interested readers will have both read the Logotron manual and have had some experience in orthodox BASIC programming. In an occasional series, I hope to provide further discussion and illustrative code aimed at developing the advantages of LOGO over BASIC with particular emphasis on list processing methods. It would, however, be helpful if LOGO users could write to me and tell me how they are using the language, what problems they are encountering and what aspects of the language and its application they would like to see covered in this column.

◆ LISTING 1 ◆

```

TO ASK
MAKE "Q ( :Q + 1 )
PR SE [Do I like] ITEM :Q :TESTLIST
MAKE "ANS RC
PR :ANS
MAKE "ANSWERS LPUT :ANS :ANSWERS
END

TO TEST
TS
PR [Try to answer each of the]
PR [following questions:]
PR [Type Y or N]
PR [ ]
MAKE "Q 0
MAKE "ANSWERS [ ]
REPEAT 10 [ASK]
IF EQUAL? :ANSWERS :CORANS [PR [Well
done you have solved the problem] MAKE
"WON TRUE] [TS PR [You have failed the
test] PR [Please continue]]
END
    
```


L E A R N I N G L O G O

```
TO INSTR? :LETTER :WORD
IF EMPTY? :WORD [OP FALSE]
IF EQUAL? FIRST :WORD :LETTER [OP TRUE]
OP INSTR? :LETTER BF :WORD
END
```

```
TO LIKES? :NAME
MAKE "T1 ( AND INSTR? "A :NAME NOT
INSTR? "T :NAME )
MAKE "T2 ( AND INSTR? "T :NAME NOT
INSTR? "A :NAME )
IF ( OR :T1 :T2 ) [OP TRUE] [OP FALSE]
END
```

```
TO PLAY
IF :WON [STOP]
PR [Give me a name]
MAKE "NAME FIRST RL
IF EQUAL? :NAME "QUIT [PR [Thanks for
playing] STOP]
IF EQUAL? :NAME "TEST [TEST MAKE "TESTED
TRUE] [MAKE "TESTED FALSE]
IF :TESTED [ ] [IF LIKES? :NAME [PR SE
[Yes I like] :NAME] [PR SE [No I don't
like] :NAME]]
PR [ ]
PLAY
END
```

```
TO NAMES
TS
MAKE "WON FALSE
PR [If you type in the names of people]
PR [I will tell you whether or not I]
PR [like them. When you think you know]
PR [the rule that I am using type TEST]
PR [To give up type QUIT]
PR [ ]
PLAY
END
```

```
MAKE "TESTLIST [ALEXANDER PERSEUS
XIMENES RASPUTIN CALLIGULA DEMETRIUS
LUCIFER KATARINA TREEHORN LOHENGRIN]
MAKE "CORANS [Y N N N Y Y N N Y N]
```

```
PPROP "DUCK "BIRD "YES
PPROP "DUCK "SWIMS "YES
```

```
PPROP "PENGUIN "BIRD "YES
PPROP "PENGUIN "FLIES "NO
PPROP "PENGUIN "SWIMS "YES
PPROP "PENGUIN "FOUND.IN.UK "NO
```

```
PPROP "CHAFFINCH "BIRD "YES
PPROP "CHAFFINCH "SINGS "YES
```

```
PPROP "ROBIN "BIRD "YES
PPROP "ROBIN "SINGS "YES
```

```
PPROP "BIRDS "FLIES "YES
PPROP "BIRDS "SINGS "NO
PPROP "BIRDS "SWIMS "NO
PPROP "BIRDS "FOUND.IN.UK "YES
```

```
PPROP "PIGEON "BIRD "YES
```

```
TO LKINFO
TS
PRP [BIRDS gives list of all birds known
to the program]
PR [QUIT returns to menu]
PR [ ]
END
```

```
TO LOOKUP
PR [Give me a bird's name]
MAKE "NAME FIRST RL
IF EQUAL? :NAME "QUIT [STOP]
IF EQUAL? :NAME "BIRDS [LISTBIRDS]
IF MEMBER? :NAME :BIRDS [FACTS :NAME]
[IF NOT EQUAL? :NAME "BIRDS [PR [ ] PR [I
don't know that one] PR [ ]]]
PR [ ]
PR [ ]
LOOKUP
END
```

```
TO LISTBIRDS
PR [ ]
PR [I know facts about the following
birds:]
PR [ ]
PRP :BIRDS
PR [ ]
END
```

```
TO FACTS :BIRD
PR [ ]
PR SE [FACTS ABOUT THE] :BIRD
PR [ ]
PR SE "FLIES: FINDPROP :BIRD "FLIES
PR SE "SINGS: FINDPROP :BIRD "SINGS
PR SE "SWIMS: FINDPROP :BIRD "SWIMS
PR SE [FOUND IN UK:] FINDPROP :BIRD
"FOUND.IN.UK
END
```

```
TO SAVEBIRDS
*DEL.BIRDS
SAVE "BIRDS
END
```

```
TO MENU
TS
VDU [31 10 2]
PR [BIRDS DATABASE]
VDU [31 10 3]
PR "
VDU [31 10 6]
PR [1. LOOK UP BIRDS]
VDU [31 10 8]
PR [2. ADD / REPLACE DATA]
VDU [31 10 10]
PR [3. SAVE DATABASE]
VDU [31 10 12]
PR [4. QUIT PROGRAM]
VDU [31 10 20]
TYPE [ENTER CHOICE :]
MAKE "CHOICE RC
PR :CHOICE
IF AND :CHOICE > 0 :CHOICE < 5 [STOP]
MENU
END
```

```
TO ADD
TS
```

```
PR [Name of bird]
MAKE "NAME FIRST RL
IF EQUAL? :NAME "QUIT [STOP]
PR [ ]
PR "FLIES?
MAKE "ANSWERS RL
PR "SINGS?
MAKE "ANSWERS LPUT FIRST RL :ANSWERS
PR "SWIMS?
MAKE "ANSWERS LPUT FIRST RL :ANSWERS
PR [FOUND IN UK?]
MAKE "ANSWERS LPUT FIRST RL :ANSWERS
MAKE "ANSWERS EXPANS :ANSWERS
END
```

```
TO UPDPROPS :P :A
IF EMPTY? :P [STOP]
MAKE "P1 FIRST :P
MAKE "A1 FIRST :A
MAKE "EQ ( EQUAL? GPROP "BIRDS :P1 :A1 )
IF NOT :EQ [PPROP :NAME :P1 :A1]
IF ( AND :EQ MEMBER? :P1 PLIST :NAME )
[REMPROP :NAME :P1]
UPDPROPS BF :P BF :A
END
```

```
TO UPDATE :NAME :ANSWERS
IF NOT MEMBER? :NAME :BIRDS [MAKE "BIRDS
LPUT :NAME :BIRDS]
PPROP :NAME "BIRD "YES
UPDPROPS :PROPNAMES :ANSWERS
END
```

```
TO ADDB
ADD
PR [ ]
PR [Above OK Y / N?]
MAKE "ANS RC
IF ( OR EQUAL? :ANS "Y EQUAL? :ANS "y )
[STOP]
ADDB :NAME :ANSWERS
END
```

```
TO ADDBIRD
ADDB
UPDATE :NAME :ANSWERS
IF NOT MORE? [STOP]
ADDBIRD
END
```

```
TO PRLINE
MAKE "CT COUNT :FT
PR :TEMPL
MAKE "TEMPL SE :FT [ ]
END
```

```
TO PRP2 :LIST
IF EMPTY? :LIST [STOP]
MAKE "FT FIRST :LIST
MAKE "CT :CT + ( COUNT :FT ) + 1
IF :CT > 39 [PRLINE] [MAKE "TEMPL LPUT
:FT :TEMPL]
PRP2 BF :LIST
END
```

```
TO PRP :LIST
MAKE "CT 0
MAKE "TEMPL [ ]
PRP2 :LIST
PR :TEMPL
END
```

```
TO FINDPROP :BIRD :PROP
IF MEMBER? :PROP PLIST :BIRD [OP GPROP
:BIRD :PROP] [OP GPROP "BIRDS :PROP]
END
```

```
TO EXPANS :LIST
IF MEMBER? "Y :LIST [MAKE "LIST REPLACE
"Y "YES :LIST OP EXPANS :LIST]
IF MEMBER? "N :LIST [MAKE "LIST REPLACE
"N "NO :LIST OP EXPANS :LIST] [OP :LIST]
END
```

```
TO MORE?
PR [ ]
PR [Add / replace another bird ( Y / N )
?]
MAKE "R RC
IF OR EQUAL? :R "Y EQUAL? :R "y [OP
TRUE] [OP FALSE]
END
```

```
TO BIRDS
MENU
IF EQUAL? :CHOICE 4 [STOP]
IF EQUAL? :CHOICE 1 [LKINFO LOOKUP]
IF EQUAL? :CHOICE 2 [ADDBIRD]
IF EQUAL? :CHOICE 3 [SAVEBIRDS]
BIRDS
END
```

```
MAKE "PROPNAMES [FLIES SINGS SWIMS
FOUND.IN.UK]
PIGEON]
MAKE "BIRDS [ROBIN CHAFFINCH PENGUIN
DUCK EAGLE OSTRICH JAY FLAMINGO GANNET
CHICKEN MOCKINGBIRD SWAN THRUSH PIGEON]
```

◆ LISTING 2 ◆

```
TO RANCHOICE :LIST
OP ITEM 1 + ( RANDOM COUNT :LIST ) :LIST
END
```

```
TO RLIST :LIST
IF EMPTY? :LIST [STOP]
MAKE "ITEM RANCHOICE :LIST
MAKE "NEWLIST SE :NEWLIST :ITEM
MAKE "LIST REMOVE :ITEM :LIST
RLIST :LIST
END
```

```
TO RANLIST :LIST
MAKE "NEWLIST [ ]
RLIST :LIST
OP :NEWLIST
END
```

◆ LISTING 3 ◆

```
PPROP "THRUSH "BIRD "YES
PPROP "THRUSH "SINGS "YES
```

```
PPROP "SWAN "BIRD "YES
PPROP "SWAN "SWIMS "YES
```

```
PPROP "FLAMINGO "BIRD "YES
PPROP "FLAMINGO "FOUND.IN.UK "NO
```

```
PPROP "GANNET "BIRD "YES
PPROP "GANNET "SWIMS "YES
```

```
PPROP "CHICKEN "BIRD "YES
```

```
PPROP "MOCKINGBIRD "BIRD "YES
PPROP "MOCKINGBIRD "SINGS "YES
PPROP "MOCKINGBIRD "FOUND.IN.UK "NO
```

```
PPROP "JAY "BIRD "YES
```

```
PPROP "OSTRICH "BIRD "YES
PPROP "OSTRICH "FLIES "NO
PPROP "OSTRICH "FOUND.IN.UK "NO
```

```
PPROP "EAGLE "BIRD "YES
```


Brushing Up

Is the Microbrush Graphics System the natural choice for the professional computer artist?

There have been many Computer Aided Graphic (CAG) packages available for the Beeb but none of them have really inspired me — most offer few features and are very restrictive and cumbersome to operate. However, AB Designs (who are well known for their AB2 graphics package), have just released their *Microbrush Graphics System*.

The *Microbrush Graphics System* is available in two versions: *Microbrush A* for the Model B and Master series, and *Microbrush B*, an enhanced version for the Master series only. *Microbrush A* costs £150 whilst *Microbrush B* costs £200, both prices inclusive of VAT and postage and packing. Educational and bulk order discounts are available.

This month I'll be taking a look at *Microbrush A*, with updates on *Microbrush B* in a future issue of A&B.

Microbrush

The *Microbrush Graphics System* can be used for producing colour or black and white artwork. The program uses either Mode 0 or Mode 1 and provides a palette of either 42 half-tones or 42 colours depending upon which Mode is being used.

Microbrush A consists of two 16K EPROMs, a 132 A5 page spiral bound instruction manual, and three 'flippable' discs.

The *Microbrush Graphics System* has been designed in a modular form. This means that any extra facilities can be easily added to the system, and then become an integral part of that system.

The *Microbrush ROM* is central to its operation. This ROM contains the paintbox system and line drawing routines, ikon generator and drag system, type-setter, full colour rubber and fill routine.

The second ROM is the *Injector ROM*, which contains the screen utilities (the screen editor and special effects generator), zoom shape generator, line drawing functions for producing lines, circles, ellipses, three to eleven-sided polygons, and a host of other useful functions.

The accompanying 'flippable' discs contain the pixel editor, colour palettes, zoom shape definitions, thirty type-faces, an Epson compatible FX80 screen dump routine, ikons, and sample screens.

The *minimum* hardware requirement to operate the *Microbrush A* is a BBC Model B

or Master series microcomputer, with an Epson compatible FX80 dot-matrix printer, 40 track single-sided floppy disc drive, Acorn compatible DFS, and either a trackerball or mouse.

As the system uses the high resolution graphic Modes, a hi-resolution monochrome monitor or medium-resolution colour monitor are preferable. If a low resolution monitor (especially a television set) is used, moiree patterns will appear on the screen in certain circumstances, and can be most distracting.

The system can be operated by either a trackerball (Marconi RB2) or a mouse. Throughout this review I shall refer to the trackerball, although the mice button control combinations are the same.

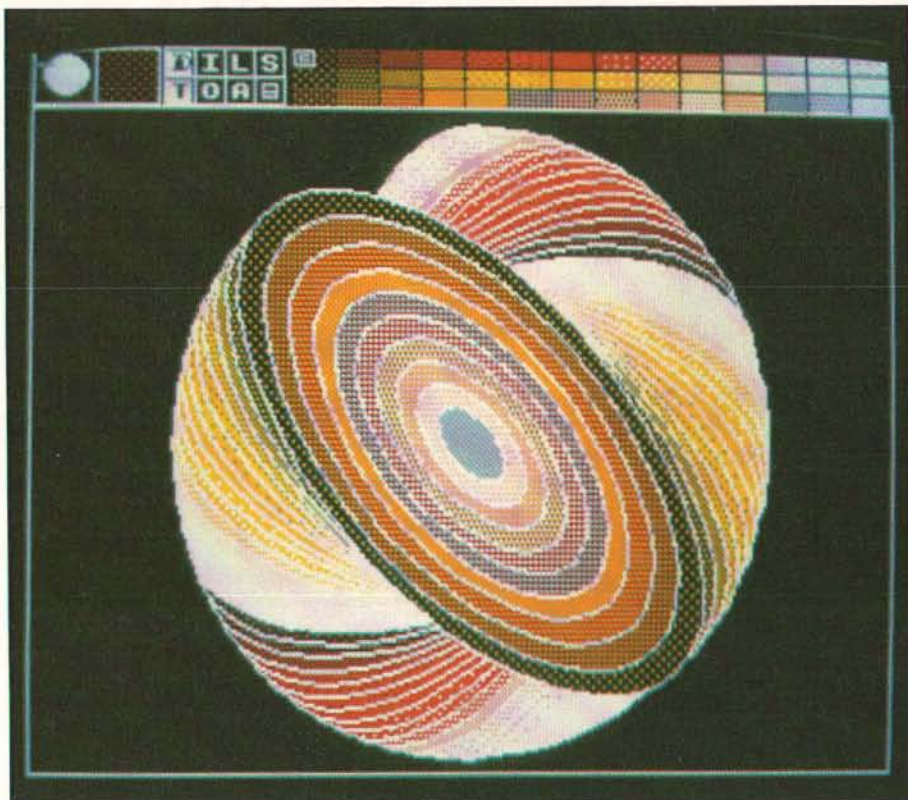
Putting the boot in

The *Microbrush* system can be entered by booting up the main *Microbrush* disc or by

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entering the command ***MB**. If the screen is already in either Mode 0 or Mode 1, then the paintbox will be entered in that Mode with the screen preserved, otherwise Mode 1 will be entered and the screen cleared.

The system defaults to using the trackerball as the input device, although this can be easily changed. The command ***MBM** will enter the paintbox as described as above, but with the mouse selected. When booting up from the disc the boot file can be easily modified so that mouse operation is selected.

As the program has been designed to be compatible with all of the BBC range the DFS, as opposed to the newer ADFS, *must* be used. The program defaults to using only drive 0 but the software can be configured to use drives 1,2,3, and 4 in addition (if available). Drive 4 is supported for those using RAM disc systems, eg Morley or Solidisk RAM discs, which usually default to drive 4.

Paintbox

In the paintbox system the top three lines of the screen are used to display the current paintbrush and colour, various painting options and the palette. In Mode 0 the colour palette is made up of 42 colours in Mode 1, 42 half-tones in Mode 0.

To start painting the right button is pressed to take the cursor into the palette where once the required colour has been selected, the centre button is pressed to lock it in. The paintbrush appears in the new colour and can be moved around the screen with the trackerball. Pressing the left button will paint the colour on the screen.

The paintbrush can be changed by pressing

the centre button, which will then cycle through the available paintbrushes in the display box at the top-left hand of the screen. The default paint brushes are circular, but these can be changed to square brushes, and vice versa.

Microbrush allows you to define your own paintbrushes, which can then be saved to disc

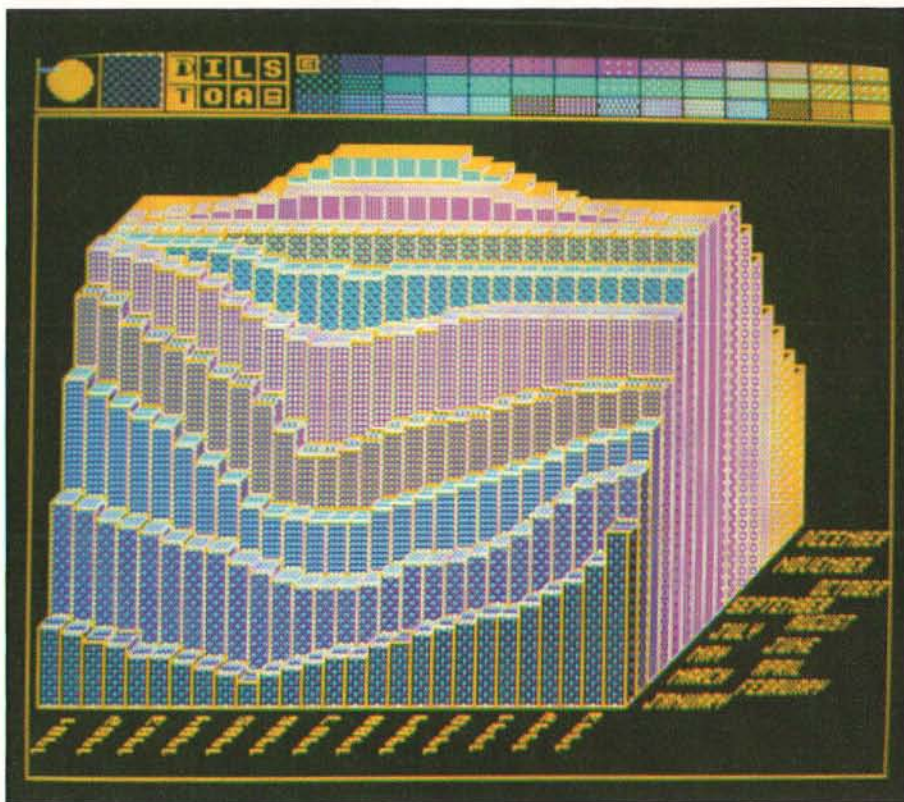
for later use. Apart from the usual type of paintbrushes, Microbrush also offers colour paintbrushes which act as a filter to the brush colour. Paint brushes can be mirrored both horizontally, vertically, and also rotated.

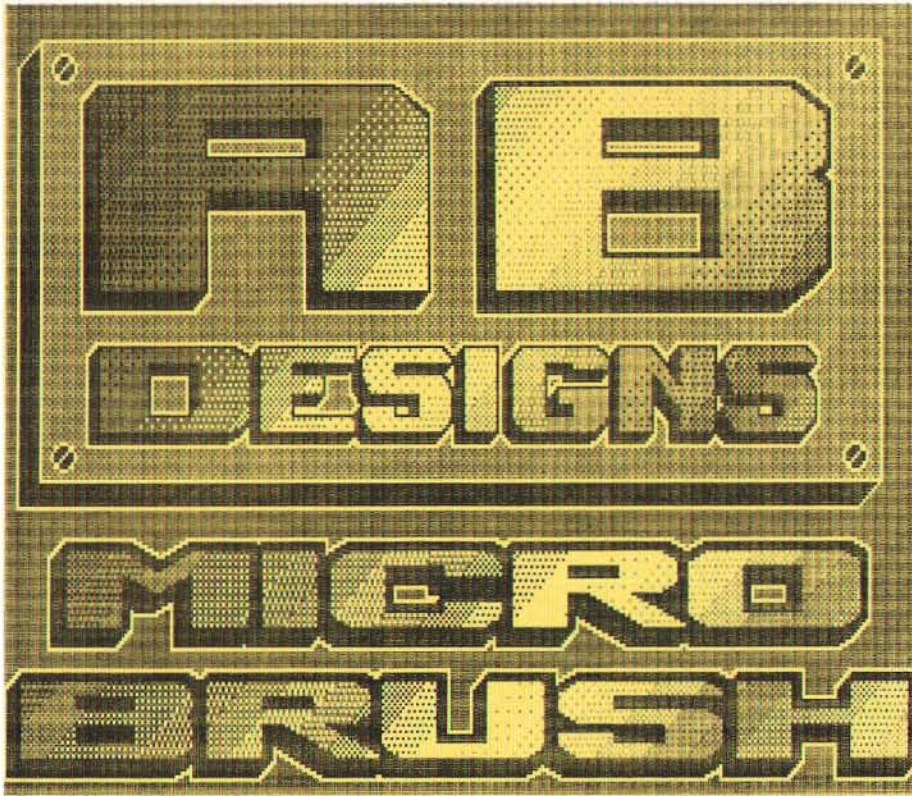
The paintbrush can operate in one of three modes: transparent, opaque, or amalgamated and background. Transparent painting causes any black in the current colour to be treated as transparent and allow the areas of the screen underneath these to be seen. Opaque painting treats any black in the current colour to be treated as opaque.

Amalgamated painting allows the brush to only paint over the foreground colours, leaving the background colour unaffected; this is most useful for recolouring a picture. The Amalgamated routine can also be used to paint 'behind' objects, causing the colour to be painted on the background colour only.

Each palette comes complete with 42 colours or half-tones for use with the paintbrush, 9 pre-defined paintbrushes, and 46 programmable paintbrushes. A further set of five different palettes are also supplied on one of the accompanying discs and can be loaded in and used instead of the standard palette. If you still can't find the colour/half-tone required, then new colours can be designed. This involves producing a sample of the new colour on the screen, which is best achieved by using the pixel editor and then transferring this new colour into one of the colour palette boxes.

Microbrush is extremely versatile in that it can use colours with repeat patterns of up to 8 pixels both horizontally and vertically - other CAG packages restrict repeat patterns to two, four, or eight pixels.





The dot pattern of individual colours can be shifted both horizontally and vertically. This can be used to produce interesting interference patterns, and thus create new 'colours' for use with the system.

To produce straight lines, a variable line drawing routine can be called upon. When the paint brush is at the start of the required line, (I) is pressed, then at the end of the line (L) is pressed. A line will be drawn between those two points, using the current palette colour and paint brush.

To move the paint brush horizontally or vertically, the cursor control keys can be used. This way is more accurate than using the trackerball. The speed at which the paint brush moves can also be adjusted (from one pixel to 8 pixels at a time). It's also worth pointing out that a software horizontal, vertical, and total lock can be applied to the trackerball, and that the sensitivity can also be changed (high, medium, and low).

Due to the way that the colours have been constructed, it is not possible to have a 'flood-fill' routine. However, a fast fill routine is provided, and when called upon, it will fill an area bounded by an unbroken outline (although gaps may occur they can be easily filled in). Should the outline be broken, the fill routine will 'escape' outside the desired area, possibly causing disastrous effects, and destroying hours of valuable work.

Sooner or later, the use of a rubber will be required to remove one mistake or another. The advantage of Microbrush over other CAG systems is that the rubber is a *colour* rubber, and can thus be used to *selectively* rub out one of the colours, or all of the colours. The other advantage is that the rubber is in the shape of the current paint brush, and can thus be used

with great sensitivity when used in conjunction with one of the smaller paint brushes.

Disc access system

When it becomes necessary to load or save a file from disc, the menu area is entered and the (L) or (Cedilla) options chosen for loading and saving respectively.

Once selected, the colour palette display is replaced by a list of files in the current directory. The display is sufficient for only nine files to be displayed — the other files can be seen by pressing the left or right buttons to scroll the display up or down. A file is selected by placing the cursor over it and pressing the centre button. In the case of saving a file, if the cursor is over a blank area when selected, a prompt will appear for the filename to be saved to. To the far right of the display are details of the current drive number and directory, which can both be easily changed.

Should a picture be loaded up into the wrong Mode, the Mode conversion utility can be used. Pressing (9) will convert the picture in the current memory to that of the current Mode. The colour palettes can also be converted from Mode 1 to Mode 0, and vice versa.

The ikons

The ikon system is entered by going up to the menu and selecting the (I) option. The ikon generator is a powerful system allowing up to 46 3 by 3 character blocks to be recalled for instant positioning anywhere on the screen. The ikons can contain anything from logos, to symbols or typeface characters.

The colour palette display is replaced by

a selection of 9 from the 46 ikons. The ikon display can be scrolled through and the ikon required selected. The ikon system is similar to that of the paintbrush system, with the painting options available, and the colour rubber as well. The paint brush takes the form of the current ikon which can then be accurately positioned. The system is really fast when it comes to moving the ikons around the screen — much faster than other systems that can only support 2 by 2 character ikons!

The ikons can be mirrored horizontally, vertically, and also rotated. Ikons can be designed on screen using the paint box system, and then loaded into the ikon generator for use as ikons. Any ikons designed can be saved to disc for future use.

Type setter and generator

To initialise the type setter, a type face has to be loaded from disc. Once this has been done, Microbrush will know that it has just loaded a type face, and will enter the ikon system and call the type setting routine.

There are fifty typefaces supplied with the Microbrush system and these fall into two categories: text faces and display faces. Text faces are used for producing upper and lower case characters, whereas the display faces contain the upper case characters only, along with numerals, punctuation marks, and various symbols.

A typeface character is picked up in the same way as an ikon. The character is then positioned on screen using the trackerball and the left button pressed. It is printed and the cursor automatically moved along with proportional spacing between the characters, although this facility can be turned off if desired. Then the next character can be selected and printed, and so on until the text is built up.

To introduce spaces between words the centre button is pressed. To help your layout, a left margin can be defined. To return to the margin on the next line the () key is pressed. The line spacing will depend upon the typeface in use.

All of the various parameters for use with the type setter can be altered, namely line spacing, word spacing, proportional spacing, and descenders. Should you save the typeface to disc then these parameters will be automatically saved alongside it.

Typeface characters can be designed using the paintbox system, and then sent to the generator and incorporated into the current typeface. Due to the way that characters are constructed, they can be made up from eight or so basic shapes, which can then be mirrored, rotated, and edited to make the complete character set.

Typesetting utilities

The Injector ROM contains the following

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typesetting utilities: **AL** This is used in helping to align the typeface characters. **HALF** When Mode 1 typefaces are converted for use in Mode 0, they are very wide. To compensate for this, the HALF facility in the Injector ROM can be used. This will halve the width of the typeface currently in memory, thus making it more suitable for use in Mode 0. **LCT** This is used to adjust the proportional spacing parameters.

Screen editor

The screen editor allows up to twenty windowed areas of the screen to be stored to memory or disc. Once stored, these windowed areas can be moved around the screen using the fast drag system, printed, or sent to the special effects generator. The windowed images can be saved to memory, and recalled at later use. These saved images can also be saved to disc, and loaded up at a later date.

Once the editor is called, a rubber banded rectangle appears and this can be moved around the screen using the trackerball and set to the desired size to encompass the required section of the screen (up to a maximum of 1/4 of the screen size).

When the rectangle is over the designated area, pressing (RETURN) will place the marked area into the memory. Once stored, the mobile image can be scrolled around its window using the cursor keys in conjunction with the CTRL key. The image can be moved around the screen using the trackerball and printed by pressing the (Space Bar).

The real beauty of the screen editor is that the windowed images can be sent to the special effects generator.

Special effects

The Special Effects Generator (SFXG) is an integral part of the screen editor and offers the ability to manipulate any images on the screen. The required area of the screen is placed into the screen editor store as described above.

Pressing the (O) key will cause the current image to be outlined. (T) will tint the current image ie change its colour. This has no effect in Mode 0 as there is obviously only one foreground colour. (W) will cause the image to be whited out, ie all the colours changed to white. The image can be half-toned by pressing (H) and (I) will invert the image. In Mode 0 black will become white and white will become black. In Mode 1 the colours will be EORed.

Function key effects

The real *piece de resistance* of the special effects generator is the ability to program the function keys to produce SFX on demand.

When the screen editor is used on a Model B the function key definitions are automatically loaded. On a Master and Master Compact, the command ***KL (fsp)** will have to be used. This



is because the definitions are not in main memory but instead they are in the Machine Operating System (MOS) private RAM. A complementary command ***KS (fsp)** is used for saving the function key definitions.

There are two function key files on disc, "KEYS" which is the default file, and "ITAL". Once the required screen area has been placed in the effects memory, each of the function keys can be pressed to manipulate the screen data to produce some weird and wonderful effects.

For the KEYS file, the effects available are thin, thicken, produce 'third' dimension, outline with black inline, 'third' dimension with outline, and half-toned 'third' dimension

The ITAL file is used to italicise the lines in the image. Pressing f1, f2, or f3 will italicise the bottom first, second, or third lines of the display respectively.

The system is very flexible and allows you to build up your own function key effects. The instruction manual provides four clear step-by-step examples of how this can be achieved.

Injector ROM

The Injector ROM is the second ROM that constitutes the Microbrush A graphics system. This ROM contains a host of useful drawing utilities including the above mentioned screen editor and effects generator and typesetter.

To enter the Injector ROM, the options menu at the top of the screen is entered by pressing the right button. The pointer should then be moved over the current paint brush symbol and the left button pressed. The colour palette/ikon display to the right of the options menu will then be replaced by the Injector ROM's menu. The left and right buttons are then used to scroll this menu up and down.

When the required option is displayed the pointer is moved over it using the trackerball and the centre button pressed.

The Graphics Injector ROM offers the following drawing facilities: **Rubber-banded line drawing** This is a fast rubber banded line drawing routine that is capable of not only producing continuous lines, but parallel lines. The routine is accessed by selecting the LINE option. The centre and right buttons are pressed to freeze and lock in an existing line for the parallel line drawing routine. The 'parallel' line can then be moved around the screen in the usual manner with the trackerball and then painted.

Like all of the drawing facilities provided by the Injector ROM, the colour of the line, etc., is determined by the colour of the colour rubber (it might sound crazy but it does make sense — honest!). **Rectangle, circle, elliptical and Arc routines.** These routines are entered by selecting the RECT, CIRC, ELIP, and ARC options.

The shape chosen will then be displayed on the screen as a series of dots marking the vertices (or in the case of the circle and elliptical and arc routines the outline) of the shape. To enable the shape to be seen as it would be painted, and thus to allow for accurate positioning, the dots can be replaced by a solid outline of the shape by selecting the D/L option which toggles between 'dots' and 'lines'. This applies to all of the shapes drawn using the Injector ROM.

The shapes can be 'dragged' across the screen using the trackerball, and can be enlarged or reduced in size, and rotated (see ROT facility below). Besides painting the outline of the shape, a solid shape can be produced. **Polygon routines** The Injector ROM contains routines for producing polygons

ranging in size from three to eleven sides, ie from triangles to endecahedrons. The one required is chosen by selecting either TRIA, DIA, 5side, 6side and so on. **Shape rotation** All of the above shapes can be rotated by selecting the ROT routine. This asks for the angle of rotation required in the range of 0 to 360 degrees, in steps of one degree.

Miscellaneous screen utilities

The Injector ROM contains some useful utilities for manipulating the screen image.

REV and U/D allow the whole of the screen to be mirrored horizontally or vertically. If these routines are used from the screen editor then only the section of the screen in the editor will be mirrored.

As has been previously stated, the top three lines of the screen are taken up displaying the palettes, option menu, etc. The routine TOP allows pictures to be created that allow those

option is selected. The shape is entered using a rubber banded line drawing facility. Each shape definition is allocated 255 bytes. A move command occupies six bytes and a draw command four bytes which means that the maximum number of lines available to construct each shape with is approximately 63 lines.

The USE command controls the zoom shape. At that time the cursor should be at the centre of the shape. This centre is used when enlarging or reducing the shape. It is also used as the centre for the solid fill routine and should thus be placed sensibly.

The Injector ROM also contains two useful routines for editing zoom shape definitions. ALTER is used to alter specific vertices of the lines forming the shape. The DEL facility will delete the last line constituting the shape.

One of the discs accompanying the package contains a host of such zoom shapes ranging from the characters of the alphabet to the AB Designs logo.

The screen will clear and the seven by seven character rectangle will then appear on the screen blown up showing the constitution of the individual pixels. To the right will be two images shown in real size of the rectangle as it was and as it is during editing.

The trackerball is used to move the editing cursor around the screen. The colour of each individual pixel can be changed allowing intricate designs to be produced. This intricate editing can also be used for designing new colour palettes or typefaces. Pressing (K) and (L) will produce a line.

To help in editing, a grid around each pixel can be drawn. The size of the pixel cursor can also be altered. The complete image can also be inverted, cleared, or restored to its former state before editing began.

The pixel editor can also be used to redefine the Beeb character set. This is achieved by selecting the C.DEFS option. The title at the top of the screen will register this by changing to "Character Definer". The

abcdefghijklmnopq	SERF1	ABCDEFGHIJKLM	F0	ABCDEFGHI	BROADWAY	The type faces shown below have been specifically designed for use in mode 0 only.
abcdefghijklmnop	SERF2	ABCDEFGHIJK	F1	ABCDEFGHIJKL	B5	
ABCDEFGHIJKLM	SERF3	ABCDEFGHIJK	F2	ABCDEFGHIJ	B6	
ABCDEFGHIJKL	SERF4	ABCDEFGHIJK	F3	abcdefgh	SERF 3	
ABCDEFGHI	SERF5	ABCDEFGHIJK	F4			
ABCDEFGHI	SERF6	ABCDEFGHIJK	F5			
abcdefghijklmnopqrstu	TEXT1	ABCDEFGHI				ABCDEFGHIJKLMNPOQRSTUVWXYZ 05M
abcdefghijklmnopq	TEXT2	ABCDEFGHI				ABCDEFGHIJKLMNPOQRSTUVWXYZ 05M2
ABCDEFGHIJKLMNPOQRSTUWV	A0	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0TEXT1
ABCDEFGHIJKLMNPO	A1	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0TEXT2
ABCDEFGHIJKLM	A2	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0TEXT3
ABCDEFGHI	A3	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0TEXT4
ABCDEFGHIJKLMNPOQRST	B0	ABCDEFGHI				ABCDEFGHIJKLMNPOQRSTUVWXYZ 0R0
ABCDEFGHIJKLMNPO	B1	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0SERF
ABCDEFGHIJKLM	B2	ABCDEFGHI				abcdefghijklmnopqrstuvwxy 0SERF2

The selection of type-faces shown above are the twenty one fonts provided with the MICROBRUSH rom.

extra three lines to be used. The routine scrolls the screen either up or down by three lines, saving the unexposed section to disc for later retrieval and combination with the screen to form a picture that fills the whole screen.

Zoom shape generator and editor

The zoom shape generator is a powerful facility provided by the Injector ROM enabling the manipulation of defined line drawn objects. The polygon drawing routines detailed above are in fact part of the zoom shape generator.

Zoom shapes can be moved around the screen with the trackerball using the 'fast drag' facility. They can be enlarged, reduced, squashed, stretched, mirrored, and rotated.

An editor is provided for designing zoom shapes. To enter a design the NEW SHAPE

The pixel editor

The pixel editor is a disc based utility. To execute the program the options menu is entered and the (L) option selected. The pointer is then moved over the directory symbol, the hash (£) key pressed and then the centre button pressed. This will select the hash directory. As the hash directory contains the disc based utilities, the drive number will automatically become drive 0. The ENLARGE file is then selected.

The editor can work in both Mode 0 and Mode 1. Once loaded in, a seven by seven character rectangle will appear on the screen. This rectangle is then moved around the screen using the trackerball, and when over the desired area for editing, the centre button is pressed.

character number is then entered and can be edited using the trackerball to move the pixel editor around. Once all the characters that you wish to create have been defined, their definition is *SPOOL'd out to disc so that it can be *EXEC'd and added to your BASIC programs.

The Epson FX80 screen dump

When using a graphics package, the most vital utility produces the printout of your artwork. The screen dump routine supplied with Microbrush A has been designed for use with an Epson FX80 (or compatible) printer.

The screen dump is a disc based utility and is loaded by sleecting the DUMP filename from

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the utility (hash (£)) directory. Once the program has been successfully loaded the top three lines of the display are replaced by the DUMP options.

The first choice is between a full or half dump. A full dump occupies the whole of the page when printed. For Mode 1, a half dump will produce a dump half size (ie 1/4 of a full sized dump). For Mode 0, a half-dump results in only the vertical size being reduced by half. This is particularly useful when dumping Mode 0 screens that contain text.

In Mode 0 the screen will be dumped as grey scales. In Mode 1 pictures are dumped with the colours represented as solid tones of grey, as opposed to the normal patterned

This colour separation dumping will allow reproductions of the screen to be made without the need to photograph the screen off a hi-resolution monitor. It also means that the reproduced picture will not suffer from the distortion that can occur with screen photographs due to the inherent curvature of the monitor.

Conclusions

The Microbrush A Graphics System is an extremely professional piece of software that has many useful and advanced facilities.

packages, Microbrush does not have any of those pull down menus that one normally associates with them. This is not a bad thing, as in my experience pull-down windows have a tendency to get in the way and are very time consuming — WIMP (Window Icon Mouse Pointer) by name, WIMP by nature.

I found control easier with the trackerball — the sensitivity was far superior to that of the mouse and I felt more in control, although the mouse is excellent for producing broad sweeping curves.

Should you be fortunate to have a RAM disc then this greatly enhances the system. The Morley Electronics RAM disc is ideal as this can contain all of the Microbrush support discs and still have room to spare. As there are no moving parts it is very quick and reliable. However, to access any of the programs the disc access system can't be used (for technical reasons). Instead, any of the programs or data can be loaded in manually.

The Microbrush A Graphics System has taken three years to write and is indeed a worthy successor to the AB Designs AB2 graphics system. When it comes to Computer Aided Graphic (CAG) programs for the BBC and Master series of microcomputers, the AB Designs Microbrush A Graphics system is *la creme de la creme*.

Microbrush B

The Microbrush B Graphics System costs £200 and consists of a third ROM, utilities disc, high resolution screen dump program for either an Integrex Colourjet 132 printer or an Epson FX80 (or compatible) printer, and a spiral bound instruction manual.

The ROM has features such as ten in-built typefaces that are available for instant use, a 10 point perspective routine, and 3D animation system.

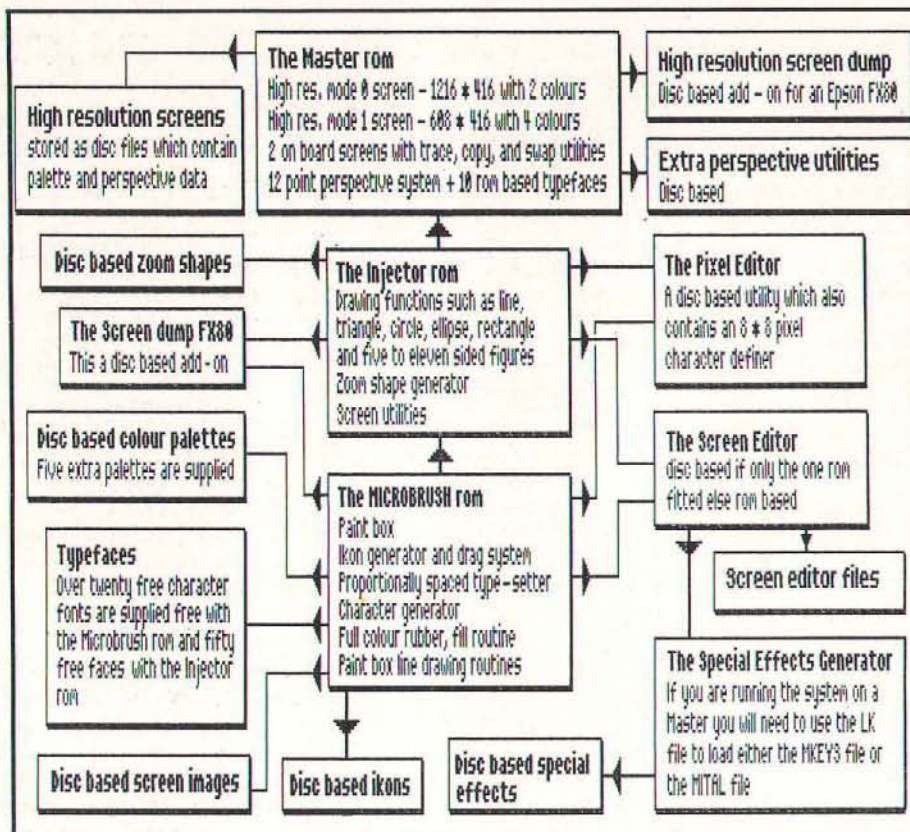
The system offers a resolution of 1216 by 416 pixels in Mode 0 and 608 by 416 pixels in Mode 1 and operates with a twin screen display. An inboard scroll routine allows pictures with a resolution of 1216 by 416 pixels in Mode 0 and 608 by 416 pixels in Mode 1 to be created which can then be dumped to either an Epson FX80 (or compatible) printer or to an Integrex Colourjet 132 colour printer.

A host of additional utilities are available for use with the Microbrush B Graphics system including an outboard scroll offering a resolution of 1216 by 2000 pixels in Mode 0 and 608 by 2000 pixels in Mode 1. A further utility is an extended colour Mode offering 4 colours in Mode 0 and 14 colours in Mode 1, with an enhanced screen dump program.

Factfile

The Microbrush Graphics System is available from AB Designs, 81 Sutton Common Road, Sutton, Surrey, SM1 3HN. Telephone 01-644 6643.

The Marconi RB2 trackerball can be obtained from the following suppliers:
Pineapple Software 01-599 1476
Watford Electronics 0923-37774/40588



tones made up of dots and lines that most normal graphic dumps produce.

The screen dump can have all of its parameters easily changed to obtain the optimum reproduction. The density and contrast of the dump can be easily modified. The dump can either be 'normal' or 'inverted' and will default to inverted.

The whole of the screen or a section of the screen can be dumped and this can be placed anywhere on the paper. An optional border can be placed around the dump and this greatly enhances the inverted dumps.

As the Microbrush package was designed for professional users, a colour separation routine has been supplied. This will dump out three pages, one for the red, one for the green, and one for the blue separations, along with register marks and colour information for the printers.

I apologise for the length of this review, but there is just so much packed into the system. Even so, I have haven't been able to describe all of the facilities offered — there are just so many!

The software and accompanying instruction manual have both been written to a very high standard. The instruction manual is clearly laid out with detailed illustrations and clear examples of how some of the more involved facilities are used. Separate chapters deal in some detail with each of the system's major functions with comprehensive instructions on the various functions that the trackerball/mouse buttons perform and other ancillary operations that are accessed by key presses. There is also a comprehensive index, and summaries of the various key functions within the various modules (an essential reference).

Unlike other trackerball/mouse driven

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Show Hours

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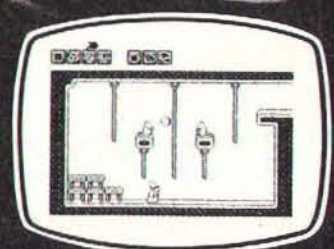
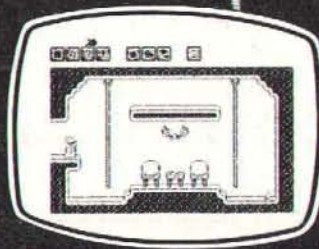
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ELECTRON PLUS 5

One of the major criticisms, often unfairly levelled against the humble old Acorn Electron, is its inability to communicate with the outside world — something the BBC Micro has never found hard to achieve.

Many people consider the BBC Micro to be a very easy computer to interface with other pieces of hardware by virtue of its many standard interfaces. Since the very earliest BBC Model B through to the latest Master 128, the interfaces have not been changed and even with Archimedes compatible ports will be available as add-on modules.

For the Acorn Electron it has always been the case that necessity is the mother of invention, and canny programmers have, on occasion, converted the Electron's only standard I/O port — the cassette interface — to act as an RS423 interface or any possible interface for many different applications.

Of course even the canny programmer is going to come up against a brick wall when it comes to implementing the Tube and the 1MHz bus on the Elk's standard connectors, and this is why Advanced Computer Products (ACP) have come up with a cracking new product called the *Plus 5*, a combined unit that plugs into the Acorn Plus 1 interface to give the humble old Elk a Tube interface, a 1MHz bus, a user port and three extra ROM sockets — all in one unit.

All the right connections

Advanced Computer Products have recently been given licence to produce the Acorn Plus 1 interface — the bridge across which all Acorn Electron interfaces are made possible. ACP's production of this board alleviates the chronic shortage of Plus 1 interfaces and should make expanding the Electron an easier task. Prior to ACP's licensing deal with Acorn, the only producers of Plus 1 type interfaces were

A three in one product, can it attain BBC compatibility for the Electron at last?

Slogger with their "ROM Box" and "ROM Box Plus" interfaces.

The Plus 5 is a small board measuring 140mm x 110mm; it plugs into any of the two Plus 1 sockets with ease and is more or less a fully enclosed unit with two screws enabling access to the circuit board, so that sideways ROMs can be plugged into it. The current range of sideways ROMs for the Electron is very poor although the compatibility ratio between Elk and BBC B is very good, especially for word processors and many of the Mode independent sideways ROMs such as the VIEW series of ROMs.

There are three sockets supplied on the Plus 5, one of which is occupied by the Tube controller ROM which handles all of the Plus 5's I/O facilities and communications protocols required by the Tube, the 1MHz bus and the housekeeping tasks for the user port. The ROM is, to all intents and purposes, invisible to the user as there are no * commands to worry about, the aim being to have the Plus 5 devices operating *exactly* as they would on a BBC Micro or Master.

The Plus 5 unit is housed in a rugged metal case and will handle a lot of rough treatment.

It is heavy enough to sit squarely enough in the Plus 1 socket and if knocked, it will not fall out, as is the case with other less substantial Plus 1 cartridge devices.

Souped up fat Elk

For many people, this will be the Plus 5's *raison d'être* as it allows complete compatibility between the BBC Micro second processors and the Electron, thus allowing large amounts of memory to be available to the user regardless of what screen Mode you are using. There is a marked speed increase in operation and the computer is more responsive as a result of connecting either a 6502 second processor, or a Master Turbo board.

The Electron VIEW package will happily work alongside the 6502 second processor, but because there are differences between the Electron and the BBC Micro's function keys, the BBC version of VIEW (version 3.0 or Hi VIEW if you have a Turbo board or a 6502 second processor) will not work, but the second processor's internal ULA is properly accessed by virtue of the fact that the BBC version of VIEW's code is relocated to give 48,000 bytes free to the user in any screen Mode.

Electron VIEW owners need not grumble, they are given nearly 30,000 bytes free to play with in any screen mode with all of the proper printer drivers accessible. Hi BASIC works properly, as does the rest of the VIEW family, including ViewSheet, ViewStore and ViewSpell (surely the only spelling checker for the Electron!). The only piece of software that didn't work was 6502 second processor Elite, but this is due to the hardware limitations at the Electron's end!

As a side issue, I used a very early version of the 6502 second processor with an unnaturally long cable, which was my attempt at testing how critical the Plus 5 Tube's timings

were, which are as good, if not better than a modern Issue 7 BBC Model B or a new Master series' Tube interface.

Talking in foreign tongues

The Acorn Z80 system was even more impressive, although if you have a "foreign" DFS such as Solidisk's or the Cumana DFS boards then I suggest you replace it with ACP's very own 1770 DFS, as it is the only DFS I have yet come across that offers complete BBC 1770 DFS compatibility.

With the ACP 1770 DFS and a Plus 5, you can use most of the CP/M utilities. The 1770 DFS is needed to format discs, a task which requires a pretty close emulation of OSWORD &7F and sometimes falls foul of "foreign" BBC lookalike DFS systems.

All of the utilities and the bundled software work on the Z80 system; for Electron owners, this means that the complete suite of business packages can be used to great effect. As a long time user of these packages, I was again pleased with the hardware's reliability and the system's ability to cope with large spreadsheets using the *Accountant* package and I even trusted it with my monthly accounts to the bank manager!

Although many users don't relish using CIS COBOL for their own applications, there is a growing user base for this old yet standard language, with many titles ready to run "off the shelf" as it were. Seeing CIS COBOL running on the Elk is a very strange sight indeed, and indeed represents the Electron's coming of age. Compile times for both CIS COBOL and UCSD-P FORTRAN programs (the latter isn't supplied with the Z80 software package) are just a little under that of the BBC Micro.

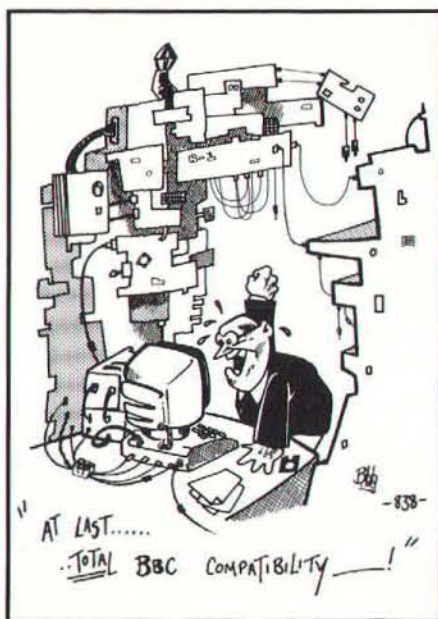
Graphplan is another package with its charms. Although attacked as an old and unfriendly package, I use *Graphplan* in preference to packages like *InterChart* which are, in my opinion, more unwieldy as a result of their *user friendliness*.

As the Electron is only being used for DFS activity, some buffering and the screen generating routines, there are none of the memory limitations associated with the Electron's greedier screen modes; as a result you can happily use *Graphplan* in Mode 1 to create effective and colourful displays from sources as widespread as CP/M spreadsheets to BBC database material.

The only package I would not touch with a bargepole on the Electron is the *Memoplan* package — for everyday use this is a real pig of a word processor of the "press a button and see how much text you've lost" variety, and I would honestly recommend the extra outlay in buying a version of *Wordstar* which is capable of much more (this review was written with *Wordstar*!).

The Acorn Z80 system on the Acorn Electron is as faithful as you can get. Only on rare occasions do the speed limitations of the Electron become apparent, and it is a very

cheap way of getting a CP/M machine from a computer costing as little as £50, especially when as little as three years ago, CP/M computers were costing up to £700.



The half meg Elk

Ahem...if I had said that the Acorn Electron was capable of emulating the IBM PC and running *Flight Simulator*, or even having a GEM front end, I think I would have been laughed out of the office. As it stands, the Master 512 board is the only second processor I was unable to properly test due to the fact that the 512 second processor couldn't be connected to the Tube socket at the time. However, since researching this review, Acorn have released their own Tube converter box for the Master 512 and the Turbo called the *Universal Second Processor*.

Looking at the hardware connections to the Master 512 from the Tube, I notice that very few changes have been made, none that are important anyway, so from a hardware point of view, the Master 512 should work on the Plus 5, which is great if you want to run MS-DOS, but a little bit of a problem for GEM and the mouse as the Electron addresses for the user port have been changed with reference to its reading and writing operations, a problem which be overcome by changing the BIOS code accessing the user port.

So, on paper, the Master 512 will work on the Plus 5 and the Tube but using a mouse will prove nigh on impossible until someone comes up with different code to read from the Electron's user port.

As soon as a *Universal Second Processor* box becomes available, I will relate my Plus 5/Master 512 findings through *Feedback*.

The 1MHz solution

The 1MHz bus is commonly used by Acorn and third party hardware companies for memory expansions, hardware devices and second processors.

Unfortunately, the chances of running a second processor from the 1MHz bus are fairly small, unless the code is modified slightly as the 1MHz bus addresses have been moved; this means that some hardware interfaces will not work properly — although some will. Of the devices I tested few worked properly, I could not manage to get the Technomatic Z80 second processor to access the disc drives, and the Music 5000 package would hang up almost immediately. The Acorn Prestel Adapter and the Acorn Teletext Adapter are both non-starters as they only operate in Mode 7, but I was lucky with the Seaward Automatic Controls SACRAM 512k RAM module.

The general incompatibility is a bit of a shame really as devices like the *Opus Challenger* would go down a treat amongst Electron users who could do with an extra 512K as a RAM disc any time. The problem is that instead of the complete page &FC (FRED) being available, only addresses of FRED &80-&8F, &A0-&AF and &F0-&FF are usable. The analogue input line is not available, but can be used as an output for the Electron's sound channel, if you wish to set the link on the PCB yourself.

Another problem is that the NNMI pin (Not Non Maskable Interrupt) is not a direct connection to the Elk's NNMI; instead, the input is regulated via the Plus 5's own clock which is placed on the trailing end of the PHI out signal. ACP's reason for doing this was to act as a buffer, stopping software from incorrectly reading the Electron's internal memory.

I hope to see ACP adjusted code for a number of products, an IEEE 488 interface would be interesting, enabling the Electron to be easily (and cheaply) incorporated into control devices especially lathe controllers and workshop and laboratory equipment — including HPIB plotters, laser printers and the like.

For the programmer, the 1MHz bus can be accessed either directly or indirectly, although it may be wise to stick to Acorn guidelines when accessing FRED JIM or SHEILA, I don't see any reason to stick to these tedious methods as the chances are that the Plus 5 will become a standard interface for the Electron.

In and out of port

Like the 1MHz bus, the user port has had to overcome some of the Electron's inherent differences between itself and the BBC Micro. The Plus 5 user port is completely BBC compatible with the exception of the address of the 6522 VIA (Versatile Interface Adapter). Again, the Electron's memory map has caused this to be relocated to FRED addresses &B0-&BF. While this causes no real problem to hardware devices being connected, changes to software are needed if the driving software is *looking* for the device.

So, devices such as trackerballs, mice, and music keyboards can be connected to the user

P L U S 5 R E V I E W

port, although very few items of software for the BBC will work straight away, certainly MAX, Pagemaker and NovaCAD didn't, and PAL technology doesn't yet extend to the Electron, so the 3D graphics package from Silicon Visions doesn't work either, although all these packages show signs of running but without mouse control, all that is needed is for the software to be slightly modified so that it reads data from a different address relating to the Plus 5.

This is where ACP are one step ahead of us all here; they have released a modified version of AMX's Super Art package originally for the BBC B. A faithful conversion, Electron Super Art comes with the support ROM and is available as an extra to Plus 5 users and may attract customers to the Plus 5 just to run this package.

I am informed that Pagemaker, now titled *Stop Press* for legal reasons is being converted to the Plus 5 format, and I look forward to seeing it as Pagemaker is one of those programming feats that takes the BBC Micro a step above other popular computers.

Anyway, Super Art will happily work with the AMX mouse, the Quest mouse and the Wigmore mouse. My personal favourite is the Quest mouse, although AMX's model is very very nice and easy to use. The AMX software is well written as always, and it can quite happily run on your DFS based disc system.

The use of a 1770 DFS is not critical here

(unlike the Z80 package) as most of Super Art is written in a strange cross breed of BASIC, operating system calls (to the mouse support ROM) and machine code. This means that a Solidisk DFS can quite happily support the software as can a Cumana disc interface (with the replacement Slogger SEDFS ROM replacing Cumana's own DDFS type filing system), although I honestly recommend anyone without a DFS to have a good look at the Advanced Computer Products 1770 DFS, as it has many advantages over other disc filing systems, both in features and by virtue of its compatibility with Acorn's 1770 DFS (in fact it holds the very same Acorn 1770 DFS ROM code).

Plug in freedom

The ACP Plus 5 is a truly innovative product, if only to allow connection to Acorn's ever growing family of second processor devices, although the implementation of a IMHz bus and user port connectors must surely be considered fuel for the fire.

Running a 6502 second processor across the ACP Tube interface proved reliable and was certainly one of the easiest ways of gaining extra memory. The Plus 5 is also the only way of running a Z80 second processor on the Electron, and the option of running a Master 512 board is a tantalizing thought.

The IMHz bus will need software support

from ACP and other Electron peripheral manufacturers if it is to gain the compatibility it so richly deserves. If the Plus 5's IMHz bus is not supported, then the IMHz bus part of it will not get very far. I hope to see more BBC peripherals converted for the Plus 5 very soon.

The user port is a very nice option, enabling the Electron to support many additional input devices including the AMX Mouse; again, like the IMHz bus, this interface needs software support and a willingness on the part of BBC software houses to modify their code in order to make their packages run on the Plus 5, AMX's conversion job of the Super Art ROM is proof of just how effective this can be.

For many users, the prospect of running a second processor is enough, but with time, this product will form the basis of many a powerful Electron system. The AP5 costs £66.70 and is excellent value for money; the mouse and Super Art package costs £69.95 and includes the mouse, a tape containing the Super Art software (transferable to disc) and the mouse support ROM. You can buy both the Plus 5 and the mouse package for £125 which is certainly a good deal if you want to use your Elk as a drawing workstation.

Factfile

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PRESENTING PASCAL

To start off this episode of the Pascal saga it is worth while taking another brief look at the array structure discussed in a previous article in the series. An array is merely a number of variables of the same type, collected in such a way that each one can be addressed by the common name of the variable array plus the numerical position of the desired item in that array.

One of the array structures previously discussed was the matrix or two-dimensional array **mat** defined as

```
TYPE
  vec_idx = (x, y, z);
  vector = array [vec_idx] of real;
  matrix = array [0..9] of vector;
VAR
  mat : matrix;
```

and used as

```
mat [2] [y] := 2.3;
```

An alternative way of addressing an element of this array, and one which BASIC users will be familiar with, is

```
mat [2, y] := 2.3;
```

On occasion this can be more expressive of the situation than the former method. For example, although with an array of character strings the index

```
strng [2] [1]
```

would be preferred as indicating clearly the first character of the second element in the string array, in a grid analogy the expression

```
grid [1, 3]
```

may be more explicit.

Packing 'em in

The more elements of an array which are defined the less memory is available for other use. Where the variable is numerical it is odds on that the basic storage format of the number comprises an even number of bytes;

It is time to take a further look at variable structures in this part of the Pascal series

eg an integer is two bytes and a real number is four, although this often varies depending on the size of the machine's data bus and required calculation accuracy. Character variables, on the other hand, take up only one byte per character, whilst in theory a single boolean variable only requires one bit of storage.

In an eight bit data bus micro such as the BBC there is little problem with storing any odd or even quantity of bytes, since the machine is byte orientated; bits are a little more complicated. In 16 and 32 bit machines however a problem arises. The normal mode of addressing in these machines is by taking a complete word at a time, where a word is the width of the machine's data bus.

This is not to say that a single byte cannot be addressed, merely that it is not so easy or simple. Thus in order to store one single character on a 16 bit machine it often takes a full 16 bits to store it rather than the eight bits it actually requires. How much worse for the boolean variable!

This method is not always used merely because the machine architecture is unable to address the individual byte or bit, but because operating on a full word is both quicker and, oddly enough, more economic of memory. The economics revolve around the fact that although a single character variable (one byte wide) may occupy a full two or four bytes, the

amount of code required to access anything less than the full word probably takes up at least as much memory each time the access is made as is wasted by the oversize variable in the first place.

Now this is fine when talking about single variables, particularly passed ones on the stack which are lost after use, but what about those large arrays of characters or booleans? It is likely that very little more code memory will be used in accessing an element of an array than in accessing a single variable, so the waste in oversize variables now becomes somewhat alarming.

Provision is made within Pascal syntax for *packing* an array and subsequently *unpacking* it. By declaring an array of characters as

```
VAR
  charry : packed array [1..1000] of
  char;
```

the array only takes up 1000 bytes on a sixteen bit machine instead of the 2000 bytes if it were not packed. It is unlikely for packing to be actually implemented for characters on an eight bit machine, as they are almost certainly stored in this way to start with; indeed on many 16 bit machines an array is often automatically packed by good compilers. In these cases the procedure calls concerned with packing and unpacking would merely be ignored by the compiler without causing an error. An efficient compiler should also pack boolean arrays either automatically or on command.

There are, of course, drawbacks to packing. In general the program will run more slowly when encountering them, and it is often not possible to pass a packed variable to procedures and functions, particularly as a variable (VAR) parameter. To convert an ordinary variable into a packed element of an array consider the following declaration:

C O N T I N U E S ►

TUTORIAL PASCAL PROGRAMMING

CONST

size = 25;

VAR

buff : array [1..size] of char;
word : packed array [1..size] of char;

After filling buff with characters it would be packed into the main array word with

pack (buff, 1, word);

whilst it can be unpacked again with

unpack (word, buff, 1);

The main purpose of this excursion into packing has been more to give an insight into variable storage processes and problems than to explain in detail the packing process, since it is unlikely that this will be encountered on eight bit or, indeed, on most 16 bit machines. It may be useful background when coming across the terms in various manuals however.

Conform

Variable type checking is very rigid in Pascal. This produces problems of which the originators of Pascal were not entirely unaware. Not least of these is the problem of passing different size arrays into procedures and functions. Consider the definitions

TYPE

string_1 = array [1..5] of char;
string_2 = array [1..20] of char;

VAR

str_1 : string_1;
str_2 : string_2;

Normally it is only possible to pass str_1 into a procedure whose definition is

PROCEDURE print (str : string_1);

This means that the print procedure, although obviously a potentially very useful one, can only print a string of type string_1 and no other.

The conformant array structure supplies a solution to this by permitting the definition

PROCEDURE print (str : array [first..last : integer] of char);

VAR

idx : integer;

BEGIN

FOR idx := first TO last DO
write (str [idx]);

END;

This procedure may be called with any character array:

print (str_1);
print (str_2);

The pseudo constants first and last are not actually passed into the procedure; the compiler sets them up by referring to the character array types at compile time.

Other array types may be passed in a similar way. For example numeric arrays may be processed by

PROCEDURE do_matrix (mat : array [lo..hi : integer] of array [min..max : integer] of real);

or to put it another way

PROCEDURE do_matrix (mat : array [lo..hi : integer; min..max : integer] of real);

The drawback to all of this is that very few Pascal compilers provide the conformant array syntax; not even those which conform in all other ways to the Pascal standard. Most compilers supply a special string handling method instead, but few permit the passing of other assorted arrays.

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K2614 ZX 81 SPECTRUM CENTRONICS INTERFACE	38.56	K2840 INTERFACE MOTHERBOARD FOR AMSTRAD	48.70
K2615 INTERFACE MOTHERBOARD (SPECTRUM) COMPUTERS	40.02	K2641 INTERFACE MOTHER-BOARD KIT FOR MSX STANDARD	48.70
K2618 D/A CONVERTER INTERFACE FOR HOME COMPUTER	32.80	K2642 MOTHERBOARD KIT FOR B.B.C. AND MASTER COMPUTERS	53.13
K2628 INTERFACE MOTHERBOARD (COMMODORE) COMPUTERS	51.65	K2643 MOTHERBOARD KIT FOR AMSTRAD CPC6128 COMPUTERS	55.32
K2629 REAL TIME CLOCK INTERFACE FOR HOME COMPUTER	41.35	K2612 RS232 MOTHERBOARD (B.B.M. COMPATIBLE)	123.34

VELLEMAN INTERFACE SYSTEM - BUILT AND TESTED

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M2616 INTERFACE MOTHERBOARD ZX 81	63.60	M2629S REAL TIME CLOCK INTERFACE (SPECTRUM)	59.60
M2628 INTERFACE MOTHERBOARD COMMODORE 64	80.40	M2629J REAL TIME CLOCK INTERFACE (UNIVERSAL)	58.48
M2609 OC OUTPUT BOARD FOR HOME COMPUTERS	29.96	M2633 RELAY CARD	22.31
M2610 A/D CONVERTER INTERFACE FOR HOME COMPUTER	41.92	M2634 QUAD TRIAC SWITCH CARD	32.21
M2611 OPTO INPUT INTERFACE FOR HOME COMPUTER	40.13	M2635 8 TO 1 ANALOG MULTIPLEXER INTERFACE	38.64
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Down to Business

Jon Vogler's fourth comparative printer review: dot-matrix printers for business at under £300

This is my fourth comparative review of printers, Table 1 shows the machines I have already covered in past issues. Unfortunately, many of those cost between £300 and £500 which is outside many readers' budgets so, this month, I have reviewed printers costing under £300. I wrote to fifteen different manufacturers and ended up with seven machines for review. No firm could provide a daisy-wheel at that price. One significant machine is missing: the Panasonic KX-P 1090. Try as I might, I could get no response from them or their dealers. Next time perhaps or, if you are buying, have a look at it yourself.

Since my last review, there has been a steady downward trend in computer prices (not that Acorn users will have noticed it!) and printers have also been affected. However, within this price range there was only one machine that I was really enthusiastic about. It may still be worth while setting your sights on machines in a slightly higher price bracket.

Explanation of the comparative table Tests

I have repeated some explanations of the various features and tests, making a few changes here and there to keep up with changing technology. I have also simplified the tests: one single speed test, of 5000 characters and two tests of printing quality — one in draft and one in near-letter quality. In the speed test, the timing has terminated at the end of the **printing** rather than being terminated at the end of the **computer character output**, as was done on the earliest



tests. This means that the speeds recorded in this set of tests will **appear** slower than those recorded in the October 1985 article but will be compatible with the others.

Issue	Topic
October 85	High-speed dot-matrix
March 86	Intermediate speed dot-matrix
July 86	Daisy wheels

Printer memory buffers (that is the memory built into the printer that stockpiles incoming characters from the computer: as the computer runs much faster than the printer it is thus released to do other tasks while the printer is still printing) are now becoming so common and so large and are now available in optional sizes, that by taking account of them, printing speeds would appear very inaccurate. So, if your main concern is to find a printer that does not tie your computer up for a long period, look for one that combines high draft speed with a large "input memory buffer".

As always, various suppliers have criticised my timings. I maintain that I tell you

how long the machine will take to print the kind of things you are likely to write, whereas the manufacturers' figures tell you how quickly it will print blanks, in a straight line, forever: a singularly useless and deceptive piece of "mis-information".

Prices and warranty

Some readers and some suppliers criticized my use of recommended retail prices in the earlier articles. I am afraid this is inevitable. There is no other easily obtainable basis for comparison. Manufacturers will not divulge the price they charge the retailer and to find average retail prices would entail a massive survey. Readers might work on the assumption that the best printers will be available at 10% below prices quoted here and the less good ones at 20% below but this is a very approximate guide. Shop around for the best discounts you can find. The recommended retail prices shown include VAT but no cable: all the printers tested could be run with a parallel (flat) cable from the printer port of a BBC or Master.

A few models came with a card that in-

C O N T I N U E S ►

W H I C H P R I N T E R ?

licated a warranty: usually one year although Citizen give a two-year warranty. Readers are advised to get a written statement from the dealer that the unit is in fact warranted for a whole year.

Control panels, dip switches and software

All the machines had a control panel with, usually, an on/off switch, an on line switch, a form feed switch (to feed continuous fan-fold paper to the top of the next sheet) and line feed (to feed one line). All would feed continuously if the line feed switch was held in. Some had control panel switches to select different kinds of printing, as described below.

As more print modes become available on a single printer, so the manufacturers have realized that many users cannot cope with software control for these (until there are vast improvements in the way word-processing packages are written). Therefore these modes have been made selectable on the control panel. In order to save the cost of fitting extra switches, intricate (and often very difficult to remember) combinations of switch presses will reprogramme the machine. However, only on one machine, the admirable Star NL-10, has this been taken to its logical conclusion and indicator lights included that show you which mode you have thereby selected. The old process of regularly re-setting minute, inaccessible dip switches (tiny switches, usually in banks of 4 or 8 or 10, that need a biro point to switch them) is a thing of the past.

The same results can be achieved from the control panel or by software. However for "once-off" settings you may need to alter the dip switches, for example to set whether the printer feeds one line at every carriage return. The computer's line feed can be switched off by typing *FX6,0 and the printer's by moving the appropriate dip switch. Other useful dip switch settings vary the form length and line spacing and automatically insert a one inch skip over the perforations in your fan-fold paper.

Fonts, faces, modes and pitches

There is still confusion between the words "mode" and "font" and "face". In these days of desktop-publishing, it is as well to be accurate.

A font is a family of letter shapes: printers call them by names such as Courier or Pica or Times. Within a given font you can have different faces such as: italics (sometimes called oblique), Roman (the plain upright character) or bold or bold-italic.

Dot-matrix printers will print in special modes. Modes may refer to the size (or position on the line) of what is printed: condensed, expanded, sub-script and super-script and even condensed, expanded sub-script! Condensed type is very handy if you are printing labels or tables of data. Your

STAR NL-10 Print Pitch Demo

Pitches available from front panel

80 Char/line, 10 Char/in - Normal (Pica) or NLQ
96 Char/line, 12 Char/in - Elite
136 Char/line, 17 Char/in - Condensed Pica

Additional pitches available under programme control

20 Char/line, 2.5 Char/in - Quad-high P
24 Char/line, 3.0 Char/in - Quad-high Elite
34 Char/line, 4.25 Char/in Quad-high Pica Condensed
40 Char/line, 5.0 Char/in - Double-high Pica
40 Char/line, 5.0 Char/in Pica Expanded
40 Char/line, 5.0 Char/in Quad-high Elite Condensed
48 Char/line, 6.0 Char/in Double-high Elite
48 Char/line, 6.0 Char/in Elite Expanded
68 Char/line, 8.5 Char/in Double-high Pica Condensed
68 Char/line, 8.5 Char/in Pica Condensed Expanded
80 Char/line, 10.0 Char/in Double-high Elite Condensed
80 Char/line, 10.0 Char/in Elite Condensed Expanded
160 Char/line, 20.0 Char/in Elite Condensed
Proportional print

11 Print Pitches and 16 Print Styles

Range of print pitches on the Star NL-10

local chemist probably uses it for medicine bottle labels: it shortens the letters horizontally, while maintaining their height. The condensed letter is usually about 80% of the width of a normal Pica character. Expanded is useful for posters or leaflets.

Finally, pitch indicates the number of characters per inch. The printing industry (or a modern laser or ink-jet computer printer) can vary the pitch of any font but dot-matrix printers usually only offer a font in one single pitch. For example, Pica normally uses a pitch of 10 characters per inch and Elite and Courier (the typewriter font) normally use 12. To illustrate the enormous range possible with the best modern dot-matrix printers, Star very kindly produced the display in Figure 1. There are dozens of other fonts and faces becoming available, often by means of plug-in cartridges. No reason not to end up with one you like. I used the "default" font for the samples.

NLQ, bold, emphasised and double-strike

There are also different modes of print quality: draft and NLQ (near letter quality) modes and different ways in which the dots are arranged on the paper. In case you are confused: draft is the familiar "dotty" print; no problem about that. Emphasised and bold are the same. The print has each dot in the character printed a second time, horizontally, side-by-side so that the two touch. This means that horizontal lines such as the top bar of a "T", are continuous while the vertical lines are thicker but still dotty.

Double strike on the other hand has the second dot, vertically above the first, so that vertical lines are continuous and horizontal lines thicker but dotty. In high density or NLQ mode, the second dot is more carefully positioned, so that the line is continuous, whatever the direction in which it is going.

All the printers except the Mannesmann Tally and the Oki colour printer could do near letter quality and most could do italics but not all could produce italics or bold type while in NLQ mode. The print samples, all done using a standard word processor, show those that can.

In such a jungle, what do you need on the control panel and what should be software-controlled? In general you need NLQ, condensed and expanded and other type faces (Pica, Courier or Letter-Gothic for example) from the control panel, (because you will probably use them for a whole document) while italic, bold-face, super and sub-script usually need to be invoked just for a word or phrase here and there in your text, so they should be software controlled. Most of the printers could manage proportional spacing: laying the print out so that a 'w' takes up more horizontal space than an 'i' or an 'l' to give the final print a more "professional" look.

Indicators

All the printers had LED's (Light Emitting Diodes — those tiny coloured lights the size of a sweet pea seed) to indicate whether the printer was "powered-up" (240 volt mains), whether it was "on-line" (ie whether the printer and the computer were talking to one

9th April 1987

Mr J. A. Vogler
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40 The Avenue
Roundhay
Leeds LS8 1JG



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Uxbridge, Middlesex UB8 2XV.
Telephone: 0895 72621
Fax: 0895 59200
Telex: 947050 CELUK G

Dear John,

Thanks for your letter dated 6th April 1987. I am sorry I was not available for your telephone call, but I have spent a few days at the Sicob exhibition in Paris.

Anyway, may I make a few comments.

I think overall perhaps you do not realise which market our 120D Computer Printer has been slotted in to. It is a low end machine, ideally suited for the home-user and the educational sector. It is a robust printer built for a lot of use. It's most important quality is that it is cheap. For the price of £229 the features it offers are great value for money.

Aimed at this market, and for this price, you do not expect it to print top quality business reports. That would be silly, as you would not expect a B. L. Mini to do 0 - 120 miles per hour in 4 seconds.

O. K. you say it is ugly. We considered this over a year ago and we designed a new casing and called the model an LSP10. This model has been part of our range for over a year and because of its styling it's slightly more expensive at £275. Even with this choice, people still prefer to buy the cheaper model, caring little about its looks. We have infact sold over 100,000 120D's throughout Europe in 14 months. It is our best selling printer, preferred by over 50% of our local authorities and educational establishments in the U. K. In France, for printers under 150cps, our 120D is ranked top best seller with 18% of this market. In Germany, Commodore badge a version of our 120D and sell it with their C64 and C128 home computers. Can all these people be wrong!!!

I cannot agree with your comments about its draft speed being lower than 120cps. As you know the rules and regulations of testing speed are a little ambiguous. The printhead takes time to accelerate from the left margin and slows up at the right margin. In tests our 120D's have been clocked at a speed of 135cps.

Compared to other manufacturers, the 120D is closer to its spec of 120cps than other printers in its field.

Your comments about the ugly front panel may be true in your opinion. But in my experience people prefer to pay less for the printer than to have lots of buttons to press. Fewer buttons but with multiple pressings reduces the price.

The comments you raise about the difficulty in loading paper are surprising. Never in extensive tests has this problem been raised. We have a technical department in Uxbridge who work very closely with Japan through prototypes, alfatypes and betatypes and this problem has never been raised.

If in your view the print head is 'flimsy' I can only say that we feel so confident in its reliability that we guarantee it with a 2 year warranty. Print heads returned so far are negligible infact I can not think of one.

In view of the points you have raised I enclose copies of other surveys on the 120D and also enclose an other Printer just in case you might have a 'duff' one or perhaps it was damaged in transit.

Can our sales figures and all these people be wrong? Believe me - you are on your own.

Best Regards,

Rosemary

ROSEMARY W GACKI
PRESS OFFICER

Encls.

Letter from Rosemary Gacki of Citizen Europe

another) and whether the paper had run out. Some also had an indicator light for NLQ or alternative mode and an audible alarm to tell you the paper had run out or jammed.

Paper feed, ribbons and lives

Fan-fold paper, (the folded layers with holes down either side) is fed by a tractor — a cog or sprocket which pulls each hole. Sheet paper is fed by friction between rubber rollers. All but one of the printers allowed you to adjust the width of the tractors enough to take narrow forms or continuous sheets of printed labels. An important feature was the quality of the tear-off edge. If it was sharp you ended up with a nice clean tear, even when the paper was not perforated. However several printers had tractors that mount on top of the machine and render the tear-off edge inoperative.

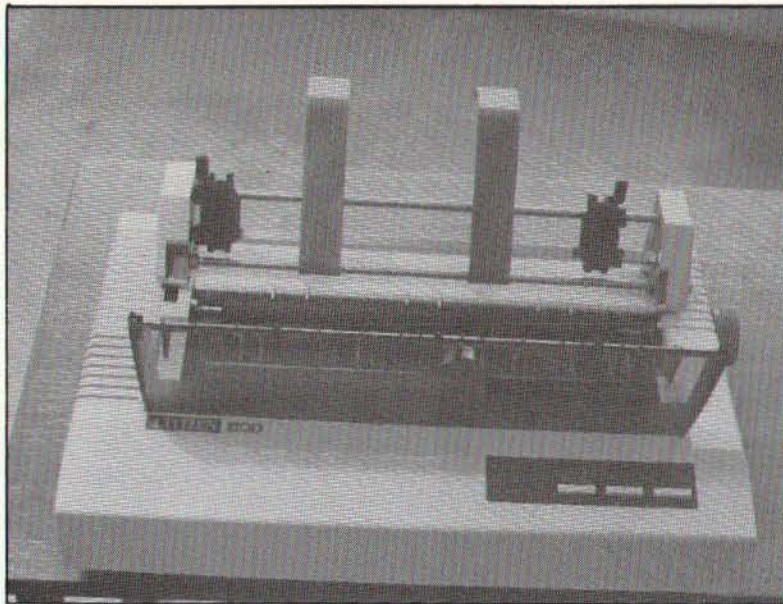
There have been notable improvements in procedures for inserting ribbons: with most of these printers you can simply place the ribbon cartridge in position, wind the tensioning knob and expect the ribbon to slide neatly between the hammer and the shield (the shield is a thin piece metal which prevents the ribbon from coming in contact with the paper unless it is struck by the hammer). As a result, I have refined my categories down to two: those where your fingers get dirty when changing the ribbon and those where they do not! The kind of ribbon that you pull out of the cassette (making your hands inky) until a loop of ribbon covers the whole width of the printer has mercifully disappeared. I was not able to check the manufacturers' claims for the number of characters that each ribbon would stand but I have recorded what they stated in their handbooks.

Most of the handbooks offered information about MLBF (Mean Life Between Failures). That means how long the printer will work properly before it breaks down and how they measure it I cannot imagine! It is difficult to compare them because two completely different ways are used for expressing it: number of hours printing and number of lines printing. If you reckon that most of these printers run at around 60 characters per second that means about 45 lines per minute or 2,700 lines per hour so, where MLBF has been expressed in hours I have multiplied this by 2,700 to get an approx comparison. Not a very satisfactory measurement. Most of the printers also specified the life of the print head in millions of characters. Frankly I would be very suprised if the OKI Microline which quotes two hundred million characters is actually nine times better than the Mannesmann Tally which only quotes thirty million.

At least, if your printer gives up the ghost after six months, you can use claimed MLBF

C O N T I N U E S ►

P R I N T E R S U N D E R £ 3 0 0



Citizen 120-D

This is the CITIZEN 120D
This is NLQ mode
This is italics
This is bold faced type
This is bold-faced italics
This is underline and
here are some descenders
yyyyy ppppp ggggg jjjjj

or print-head life as evidence when you take them to the small claims court under the trade descriptions act!

Codes and Interfaces

All the printers except the Oki Microline were advertised as "Epson compatible". Basically this means that they use the same "control codes" from the computer to change the form of printing as do the Epson FX and MX range. All the printers tested, for example, could, on receipt of the appropriate control code, produce a back-space or underline, so I have not felt it necessary to include this in the table and the same is true of certain other features like setting margins, offering an 'O' with or without an oblique slash and so on.

In many of the machines the print buffer memory space could be used to hold different sets of characters: either those from other countries, such as French with accents above them, or alternatively those defined by the user. These are often called "down-loadable" characters and are particularly important for anyone doing mathematics or other subjects that use special signs and symbols. I have indicated how many different country character sets each machine has but if you need to print one particular language you will need to check that it is available.

All the printers came with a parallel interface (that means that all the bits (binary signals), needed to make one byte (single character) travel side by side down a cable containing 8 or more wires.). I had requested this but some also could have been purchased with a serial interface (the 8 bits travel in a queue down a single wire) as an alternative and a few had both. Users of the BBC, which has a parallel printer port, are unlikely to want a serial interface.

In addition to Epson compatibility, the Oki Microline offered compatibility with the IBM PC. If you use an IBM PC in the office but a BBC micro at home then this option may be useful.

Print Quality

One of the most important features is what the print looks like when it is printed; particularly the NLQ. Are the characters a pleasing shape, are they clear and unambiguous: particularly those to be used for commercial correspondence? In particular is every part of the character clearly printed? Here the thing to look for is the descender: the part of the character that falls below the (notional) line on which the character is written. Upper case (capital) letters do not have any descenders, it is the lower case, q, g, j, p, and y, that are crucial. However, although the descender dot is also used for underlining, because it is used so infrequently, manufacturers are a bit miserly with the number of descenders, some try to make do with two where three would have produced better character formation. For example you cannot make a complete loop on the tail of a 'g' using only two descenders.

One way to check on the characters is to look at them printed on paper: another way is to look at the handbook, which often contains charts showing how the characters are made. In fact the dottiness of dot matrix printing has been one of the features that have given computers a bad name over the past decade and a measure of the quality of NLQ print, is whether the dottiness has really been banished. I deliberately did not try and test the printers for graphics printing: this is only of interest to specialised types of business and is being increasingly dominated by good quality colour printers and by lasers and ink-jets.

Quality of Manufacture

One way to judge whether a printer is well made is by how much it weighs: lightness can mean skimmed strength of parts and the use of plastics where steel might have been stronger. The thickness of rollers and pressed metal parts is a guide and the size of the **heat sink** is important. Let me explain why.

Dot-matrix printers work with pins and hammers. The "print head" has a number of pins, on all those tested it was a single vertical line of 9 but pricier machines have a rectangle containing more. Each pin is hit by a hammer which knocks it against the ribbon to produce a single dot on the paper. Thus the print head is where most movement is happening and most heat generated and it needs to be rugged. The heat sink is the finned aluminium casting on the print head, whose job is to get rid of the heat built up by the impact of the hammers on the pins: not too important in the middle of January, but try printing a long text on a sweltering August day in a crowded office and it may mean the difference between the printer working or seizing up. I did not test the print heads to destruction but I **did** examine them carefully.

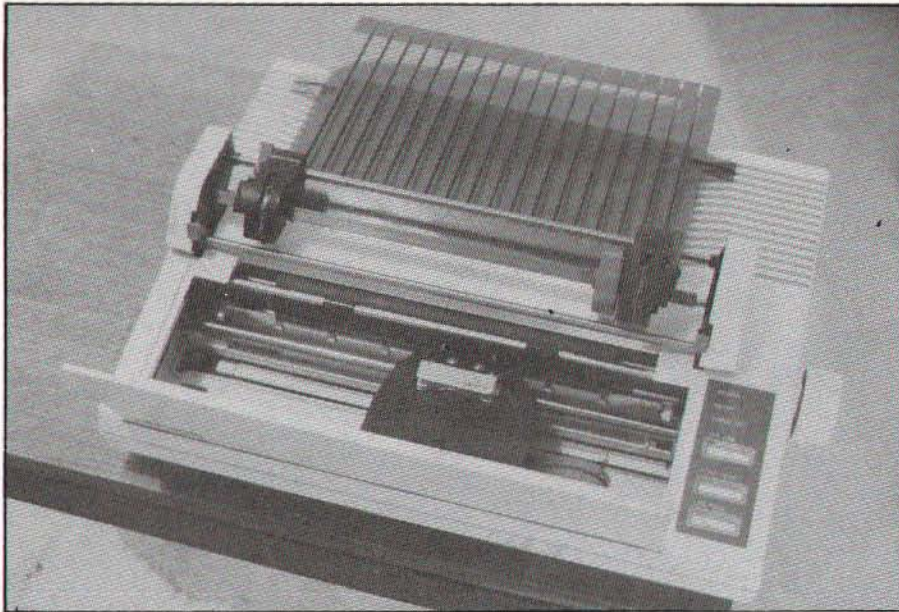
Switches also are a guide to quality. I rather dislike the flush switches hidden behind a skimpy strip of plastic tape, but most important is that one gets a satisfactory and positive 'click', to indicate that the switch has operated. Finish embraces matters such as the quality of labels, whether plastic moulding surplus has been removed and a general sense that care has been taken to produce a nice final product.

Finally my pet hate: firms who try and sell you a £300 machine and are so mean that they leave off a 50p 13 amp plug!

Is it Noisy?

This is important if you are doing the books late at night and your spouse is asleep next door, or if you are trying to hear someone on a long-distance call with the printer rattling away on the next desk. On these cheaper machines no manufacturer had taken the trouble to apply sound insulation "padding". Without a decibel meter I use a practical measure: how many closed doors were necessary before I could no longer hear the printer on a still evening.

W H I C H P R I N T E R ?



This is the EPSON LX-86
 This is draft mode
This is italics
This is bold faced type
This is bold-faced italics
This is underline and
 here are some descenders
 YYYYY ppppp ggggg jjjjj

Epson LX-86

Ease of Use

Most of the time, the printer will sit there with fan-fold paper threaded into it and you need not touch it. From time to time however, new fanfold has to be inserted or sheet paper must be used and one should be able to do this without being a skilled watchmaker or a conjurer.

The Star had a nice feature whereby, when sheet paper is being inserted, the printer would help the process with a brief auto feed of a few lines. Finally the ability to remove inevitable jammed paper, without having to undo any screws or use a crow bar, is obviously important.

Handbook

It would have been nice to report that, after bleating on this subject in these columns for two years now, printer manufacturers had learned that the quality of the handbook is every bit as important as the quality of the machine. To judge by this batch, the only people who have really learned that lesson thoroughly are Epson whose LX-85 users guide is a model of clarity and thoroughness.

To help the rest, the inset box sets out some rules for handbook writers. I particularly looked for whether all necessary details were included, whether the layout was clear and pleasing to the eye and whether explanations were lucid without being patronising. Also important is whether the numerous

This is the EPSON LX-86
 This is NLQ mode
This is italics
This is bold faced type
This is bold-faced italics
This is underline and
 here are some descenders
 YYYYY ppppp ~~ggggg~~ jjjjj

abbreviations used in printer manuals (SO, ESC, LF, CR, PCG, TOF, etc) were explained and whether the complicated, confusing process of sending computer codes to the printer was patiently explained.

Some manufacturers were very indignant: "We have put in forty pages of explanation! I had to explain that, although they define what each code does, that is no help to the reader who cannot understand such definitions because of not knowing why an **escape character** does not mean pressing the key marked "ESCAPE".

Most of the handbooks had diagrams, but their quality and usefulness varied. Still too few had an index and some had a quite inadequate contents list. A tear-out card that can stand beside the machine and remind you of the most common codes and switch settings is invaluable.

Citizen 120-D

This is a compact machine, simple in design but ugly when fitted with the tractor unit which mounts on top and has two ungainly plastic paper guides. I was not terribly impressed: it is noisy and the near letter quality mode is not at all good enough for business correspondence. Speed on my test was only 67 characters per second, nothing like the claimed 120. (However when I tested the others they were all even slower!) The control panel has only 3 switches and 3 indicator lights and is untidy: it looks as if the letter quality and auto sheet load functions had

An acceptable printer handbook should feature the following points:

- Be A5 size, spirally bound (so as to lie open easily on the desk) and have a stiff card cover.
- The contents list should occupy two or three sheets of paper and include the heading of every section with a page number. Too many handbooks still only give the page number of the chapter start.
- Indices (indexes) should occupy 6 or 7 pages, be the last item in the book and include entries for all escape and control codes.
- There should be a section explaining, very patiently, how control and escape codes work.
- There should be a summary table showing all control and escape codes and their functions.
- There should be a list of optional equipment that can be purchased or fitted, such as paper feed hoppers, alternative interfaces, font cartridges and enlarged buffers.
- There should be a specification for the printer describing all its technical features, so that the user can fully exploit large buffers, extra fonts, options and so on.
- There should be a chapter describing the interface and how it connects to various types of computer and what cables are required.
- There should be an explanation of ASCII, decimal and hexadecimal numbers.
- There should be a separate or tearout quick reference card indicating how to set the printer up to type in different modes.

been installed as an afterthought on an existing panel.

Good features are a replaceable interface cartridge (but make sure you allow for the cost of this when pricing the printer) and the ability to select 4 alternative type styles from the control panel: correspondence quality, italic, emphasised and reduced. I found it difficult to load sheet paper: you can switch between friction and pin driving but even with friction engaged the roller had some trouble gripping the sheet that I had inserted. The metal work is extremely thin: the print head looks particularly flimsy and the plastic is not much better. When the tractor sprocket covers are open they obstruct the top cover opening.

Finally, my pet hate: the hand book had no index although it does have a convenient tear-out card with all the necessary codes on and was otherwise quite nicely produced.

Before I complete reviews of printers (or virtually any other product), I send a draft to the producer, to ensure no errors or unfair statements occur. In this case a lady called Rosemary Gacki from Citizen's press office

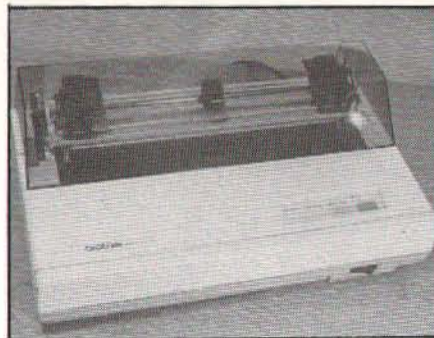
C O N T I N U E S ►

B U S I N E S S C O M P U T I N G

MAKER	CITIZEN WATCH CO	EPSON	BROTHER	STAR
Model	120D	LX86	M-1109	NL-10
Supplied by	Citizen (Europe)	Epson	Brother	Harvard Marketing
Recommended retail price (f inc VAT)	263	316	253	278
Warranty duration	2 years	1 year	1 year	1 year
SPEEDS				
Claimed max speed	120	120	100	120
Throughput speed test	67	57	43	60
MAIN SWITCH PANEL				
Form feed?	Yes	Yes	No	Yes
Line feed and On Line?	Yes	Yes	Yes	Yes
How many typestyles?	7	8	None	4
NLQ?	Yes	Yes	Yes	Yes
Line Space?	No	No	No	No
Pitch?	No	No	No	Yes four
Other?	Auto paper feed	No	No	Many
INDICATORS				
On-line?	Yes	Yes	Yes	Yes
Paper out?	Yes	Yes	Yes	Yes
Audible alarm?	No	Yes	No	Yes
Ribbon out?	No	No	No	No
DIP SWITCHES				
Form length?	Yes	Yes	Yes	Yes
Automatic line feed?	Yes	Yes	Yes	Yes
Skip perforations?	No	Software controlled	No	Yes
PAPER AND RIBBON HANDLING				
Friction?	Yes	Yes	Yes	Yes
Cut sheet feeder?	Optional	Optional	No	Yes
Max paper width (mm)?	8.5 inches	8.5 inches	8.5 inches	9.5 inches
Tractor?	Yes	Yes	Yes	Yes
Tractor width fully variable?	Yes	Yes	Yes	Yes
Tear off edge effectiveness?	None with tractor	None with tractor supplied with roll paper holder	None with tractor	Excellent
Claimed ribbon capacity (chars)?	2 million	1.5 million	half a million	two million
PRINTER TECHNOLOGY				
Bi-directional printing?	Yes	Yes	Yes	Yes
Replaceable interface cartridge?	Yes	No	Both provided	Yes
Parallel interface?	Yes	Yes	Yes	Optional
Serial interface?	Yes	Optional	Yes	Optional
Buffer size?	4 k	1 k	2.2 K	5 k (parallel) 7 k (serial)
PRINT VERSATILITY				
Proportional spacing?	Yes	No	Yes	Yes
Bold, emphasised or double strike?	Yes	Yes	Yes	Yes
NLQ?	Yes	Yes	Yes	Yes
Sub & superscript?	Yes	Yes	Yes	Yes
Italics?	Yes	Yes	Yes	Yes
No of country char sets	11	11	12	11
No of pitches	8	5	6	11
SOFTWARE CONTROL				
Epson compatible?	Yes	Yes	Yes	Yes
IBM compatible?	Yes	Yes	Yes	Yes
Self test routine?	Yes	Yes	Yes	Yes
QUALITY OF MANUFACTURE				
NLQ print quality?	Poor	Fair	Good	Excellent
Weight?	3.7kg	5.1 kg	3.5 kg	6 kg
Metal parts?	Thin	Fair	Fair	Good
Plastic parts?	Thin	Thin	Frail	Good
Type of switches?	Good buttons	Good buttons	Ugly skin	Neat skin
Finish?	Excellent	Fair	Good	Good
Claimed life () - hours between failures) - lines	5 million	3 million	4000	5 million
Claimed print-head life (million chars)	100	100	50	100
13 amp plug fitted?	Yes	Yes	No	No
NOISE				
Amount of sound padding?	None	None	None	None
How many closed doors?	2	2 or 3	2	2
EASE OF USE				
Insert sheet paper?	Fair	Fair	Poor	Excellent
Insert fanfold?	Easy	Easy	Fair	Excellent
Change ribbon?	Fair	Excellent	Good	Fair
Inky fingers?	Slightly	No	No	No
Access dip switches?	Good	Good	Good	Good
Remove jammed paper?	Excellent	Difficult	Difficult	Excellent
Mount tractors?	Easy	Easy	Easy	Built-in
HANDBOOK				
Good quality?	Yes	Yes	No	Yes
Clear layout?	Yes	Good	Poor	Good
Clear explanations?	Fair	Good	Poor	Good
Abbreviations explained?	No	Yes	No	Yes
Codes explained?	Yes	Yes	No	Yes
Diagrammes?	Yes	Yes	Yes	Yes
Detailed contents list?	Yes	Yes	Sketchy	Yes
Detailed index?	No	Yes	No	Yes
Tear-out Command Card?	Yes	Yes	No	Excellent, plastic

PRINTERS UNDER £ 3 0 0

MANNESMANN	OKI
MT80+	Microline 182
Mannesmann Tally	X-Data
229	269
1 year	1 year
100	120
45	65
Yes	Yes
Yes	Yes
None	None
No	Yes
No	No
No	No
No	Top of form
Yes	Yes
Yes	Yes
Yes	No
No	No
Yes	Yes
Yes	Yes
Yes	Yes
Yes	Yes
No	Yes
No	No
8.5 inches	8.5 inches
Yes	Yes
Yes	No
Excellent	Excellent
Not specified	3 million
Yes	Yes-
No	No
Choice	Choice
Choice	Choice
2 or 4 k	small
No	No
Yes	Yes
No	Yes
Yes	Yes
No (MT claim Yes)	No
13	1
5	8
Yes	No
No	Yes
Yes	Yes
None; draft is good	Could not achieve
5 kg	6 kg
Good	Good
Good	Thin
Good buttons	Good buttons
Good	Good
5 million	4000
30	200
No	Yes
None	None
2	2
Easy	Easy
Easy	Fair
Fair	Easy
No	No
Very difficult	Poor
Excellent	Easy
Built-in	Built-in
No	Yes
Poor	Fair
Poor	Poor
No, poor translation	Yes
A little	Yes
Yes	Yes
Sketchy	Yes
No	Yes
No	No



Brother M-1109

This is the BROTHER M-1109
 This is NLQ mode
 This is italics
 This is bold faced type
 This is bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP EEEEE jjjjj

This is the BROTHER M-1109
 This is draft mode
 This is italics
 This is bold faced type
 This is bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP 99999 jjjjj

tackled me with great determination about my poor opinion of this machine. I retested it, corrected some errors but still concluded it was less good than most of the others, particularly with regard to the quality of NLQ print. Rosemary's reply is shown in Figure 2.

I tested the new machine that accompanied the letter. Again my hands got dirty inserting the ribbon. This time the friction feed seemed to jam single sheet paper. Same result: poor NLQ print! The sample printed with this article is the one from this second, brand new machine. What Rosemary's letter does not indicate is that the stack of reviews in other journals she sent me were pretty uncomplimentary, about just the things I mention above. To quote just a few:

"The plastic moulded case does not have the thickness of printers like the Kaga or the Epson"

"Despite repeated attempts, I couldn't get the 120-D to produce reduced characters in the way its supposed to"

"...neither does the small and flimsy print-head inspire confidence."

"... normal mode is rather thin and watery."

Perhaps I am not on my own after all. Sorry Rosemary; my recommendation to A&B readers is clear: do not buy this printer!

Epson LX-86

This replaces the Epson LX-80 as the standard work-horse printer and has many of the enhancements that model lacked. The tractor unit now is a simple removable

device, with full width adjustment if you want to print labels or pay-slips. Its position on top of the machine rather spoils the otherwise streamline shape and has been so arranged that it blocks the feed control lever. So, if you have fan fold paper loaded, and want to run off an envelope, you have to remove the tractor unit before you can engage friction feed. This arrangement also means the tear off edge does not work when tractors are fitted; just when you need it. Epson say that the tear-off lid is supplied with the roll-paper holder. I feel you really need one for fan-fold; at least until the paper makers make the perforations more effective. Other machines suffered similarly: see Table 2. Only a parallel interface is available; although the handbook refers to a serial interface it gives no details but Epson tell me that a whole series of them is available.

The printer is noisy and slow: on my test it only did 57 character per second against a claimed 120 cps. The print is crisp and clear but italics do not work in near-letter-quality and many people will feel that NLQ (near-letter-quality) is just not quite good enough for correspondence although the letters are nicely formed. The Epson has no proportional spacing. There is a generous selection of 8 different type styles from the control panel but achieving them is not simple. An optional cut sheet feeder can be purchased. The handbook is excellent in every respect.

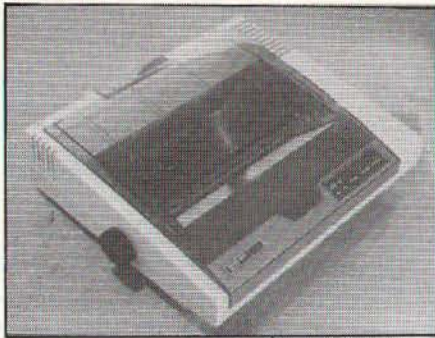


This is the STAR NL-10
 This is NLQ italics mode
 This is italics
 There is no bold-face
 nor bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP ggggg jjjjj

This is the STAR NL-10
 This is NLQ mode
 This is italics
 This is bold faced type
 This is bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP ggggg jjjjj

Star NL-10

C O N T I N U E S ►



Mannesmann Tally MT-80

This is the MANNESMANN TALLY MT-80+
 This is draft mode
 This is italics
 This is bold faced type
 This is bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP 99999 jjjjj

Brother M-1109

This is a minute machine, 13 inches wide and 8 inches deep, just the thing for the person with a congested desk. It earns Brownie points for having both serial and interfaces fitted as standard and then loses them for not fitting a 13 amp plug to the mains cable! It has the most miserly control panel: only 2 switches, of the flush skin type, and not even a form-feed button. From these you can select NLQ but no other print modes. There is no knob for winding the paper feed roller: instead you push a knurled wheel, which is quite effective, but if the paper tractor is fitted you scrape your finger on the plastic gears of the tractor. Likewise the paper feed release lever is inconveniently placed beside the tractor; however both these features result from trading ease of operation against compactness. There is a good tear-off edge on the cover but it is unusable with the tractors. I liked the neat perspex hood which fits over the tractors and, to some extent, cuts down noise.

There is also a special quiet printing mode but this is not much help because it can only be controlled by software, which means it cannot be engaged when some special circumstances (such as a plan to make half-a dozen telephone calls while printing out your trial balance) require it.

This printer is extremely slow. It managed only 43 cps (characters per second) despite a claimed 100 cps. However, I thought that the type was quite good.

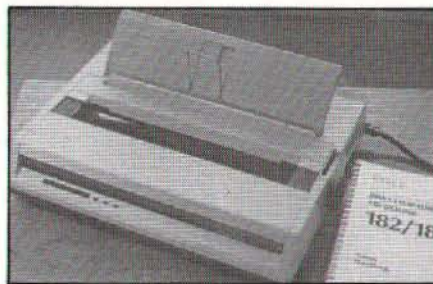
Unfortunately, the handbook is extremely poor, with only the briefest contents list, no index at all, no tearout card with details of control codes and so on, no explanations of control codes and some extremely confusing diagrams relating to the dip-switches. Brother disputed many of these comments. They say the omission of a 13-amp plug is "to keep prices down". I would have thought that could be better achieved by supplying only one interface.

Star NL-10

I liked this machine immediately. It is extremely well made and robust and has many delightful features. The first is that the tractors are built-in, so that the machine has a clean, low profile and all parts of the paper feed path are accessible in event of a jam. A delightful automatic loading sequence comes into play if you move the paper feed control lever back, so loading either fan-fold or sheet paper on this machine is extremely easy. However there is also a generous knob on the friction roller. I liked the ribbon cartridge, which has a replaceable sub-cassette to keep ribbon costs down. Another attractive feature is the replaceable interface cartridge which is fitted with a simple screw so that versatility does not also cause poor connections.

The various plastic lugs and brackets for holding covers in place were all short and stout and looked as if they would endure in contrast to the many thin, flimsy ones on other machines. It would have been nice if the interface cartridge could have been just half-an-inch nearer the edge of the printer, out of the way of the paper track but in many instances this awkwardness can be overcome by having the tractor sprockets hard over to the left; the print head will still reach to the left hand edge of the paper.

Above all, I liked the generous control panel with no less than 5 switches and 7 indicator lights, from which you could select bold or NLQ, Pica, Elite or compressed print. It also does NLQ in italic and bold italic modes (see print sample). Also featured on the control panel is micro-feeding: moving the paper a fraction of a line-feed backwards or forwards: useful, for example for mathematical formulae. There is also a



This is the OKI MICROLINE 182
 This is NLQ mode
 This is italics
 This is bold faced type
 This is bold-faced italics
 This is underline and
 here are some descenders
 YYYYY PPPPP ggggg jjjjj

OKI Microline-182

facility for adjusting the left and right margins: very handy if you produce non-standard documents.

The Star is a big machine: 16 inches wide and 13 inches deep but this space is well used to produce convenience and robustness. The only things I had against it were that it came with no mains plug fitted and the handbook (or, I should say, handbooks because there

are two: one for the printer and one for each interface cartridge) has a rather cursory index. The final imaginative feature is a beautifully produced prompt card, gaily colour printed on plastic coated paper. However what a pity that it does not also list the various control codes.

There was a disappointing sequel to this review. Two friends of mine wanted new printers so I suggested the Star NL-10. We duly ordered these then were told: "We are out of stock and do not know when Star will deliver." The end result was that my friend paid slightly more and bought Mannesmann Tally MT-85s instead. So, if you settle on this excellent printer, do check delivery promises.

Mannesmann Tally MT-80

This machine was rather a disappointment after the stunning performance of the MT-85, reviewed in a previous issue of A&B. It has no italics (Mannesmann Tally tell me it has but the awful handbook omits to explain how to get it and it does not come from any known Epson control code) and no near-letter-quality print, although it should be said that its drafting quality is as good as the near-letter-quality on some of the other models. However although it is free of the dottiness of draft mode in all the other models the characters are not as well shaped as a true near-letter-quality from a 9-pin-head should be: there is no proper descender on the "g" and the "c" has an ugly square shape for example. It printed at 45 characters per second against a claim of 100 so, if what you particularly need is speed in a fairly good type without the extreme slowness of NLQ then this might be an attractive combination.

It is extremely well made, with a large smokey clear cover, that fits over the entire printing area but, sadly, does not have much effect on cutting the noise down. Unlike the MT-85 it was not significantly quieter than other printers. The transparent cover is awkward too in that it is fully detachable and, although it pivots about a point, it will not remain in the "up" position; you have to find a flat surface on your desk to put it down.

Although the machine itself was by far the most attractive looking of those I tested, the manual was also one of the least good. It has no index, only the briefest of contents lists, seems to be a bad translation from the German (or do I mean the Japanese because the printer is not actually made by Mannesmann Tally but by Seikosha) so that it has phrases such as "Carefully stand the printer on its right side with holding by one of your hand"

When this is interspersed with escape and control codes it becomes, frankly, incomprehensible. There is an attempt at explaining codes but it is feeble and inadequate. However readers will note that this is the cheapest of the dot-matrix printers in this review and, if you are not interested in features and versatility but only in having a low cost, rugged machine that will churn

out payslips or audit trails or stock records then you might well decide that this was the one.

OKI Microline-182

In fairness, I should mention that X-DATA did not respond when I sent them a draft of the comments on the next two machines; if there are any errors I am sorry.

The Microline-182 is business-like in appearance: low and flat and square with a tiny, unobtrusive control panel. The low profile is achieved by mounting the tractor sprockets on either end of the paper friction roller and this means that you could not sprocket-drive narrow labels or pay-slips; nothing except A4 fanfold. It also means loading fanfold paper is a little bit trickier than on the other machines, because the sprockets will not rotate independently. The ribbon cartridge is minute, which makes me inclined to doubt its claimed huge capacity of three million characters (the Brother ribbon cartridge, which is at least twice as wide, claims only half a million!).

I found the Microline shoddily made. The plastic construction looks pretty flimsy; the paper feed lever looks particularly frail and the colour of the plastic cover did not match that of the printer body; one of the lugs on the model I received had already broken off (which justifies my fears about cheap, frail plastic mouldings) and there is the frailest of frail wire clips, whose function I could not discover. The handbook shows an optional tractor unit but none was included with the machine I tested. The mains connector on the back had been stupidly mounted upside down (whether by error or by design was not clear) and the machine came with a right-angle connector on the mains cable, so that the cable leaves the machine sideways in an awkward fashion. You need a screw-driver in order to get at the dip switches.

Perhaps the worst feature, for readers of this magazine, is that the machine is strictly IBM compatible and, as BBC and Master users increasingly become used to Epson printer commands, they would have serious difficulty with many of the functions. However this does not greatly matter as there are not very many functions in any case: no italics; simply Pica and Elite in condensed or double width with underline. There is what passes for an NLQ mode but I was not at all impressed by it: poorly shaped characters and no proper descenders on the "g" or "y".

The handbook is poor: the two colour printing is ugly, with jarring Americanisms such as

LPRINT "Who you gonna call?"

More important, the index is inadequate: less than a page and a half, and omits such important topics as "NLQ", "Dip-switches" (you find these under "switches, internal circuit board"), "Bold-face" (found under "printing, enhanced/emphasized" but nothing under "enhanced" or "emphasized"). All in all I was not impressed!



This is the OKIMATE COLOUR PRINTER
This is draft mode
This is italics
This is bold faced type
This is bold-faced italics
This is underline and
here are some descenders
yyyyy ppppp eeeee jjjjj

Okimate 20 Thermal Colour Printer

Okimate 20 Thermal Colour Printer

Without my really asking them to, X-DATA Ltd of Slough sent me this very unconventional machine at the same time as they very kindly supplied the Microline 182. Although it is a thermal printer it does not require the kind of thermal paper used in photo copiers, although the paper does have to be carefully chosen. If you do buy thermal paper however you can print (in black-and-white only) without a ribbon.

The machine works because the print head, instead of containing needles and hammers like a dot-matrix, contains 24 tiny heat elements which press against the ribbon. The ribbon is coated with a wax-like substance which melts onto the paper forming a series of tiny dots. If no ribbon is used, the elements come directly in contact with the thermal paper.

You can use it as a normal printer with a black ribbon but the really interesting point about the Okimate is that you can use a special multicolour ribbon and perform colour printing. Colour printing works by a process of indexing the ribbon backwards and forwards, so that the correct colour section is presented in front of the print head at the right time. This technique has three side-effects:

- the printer is very slow
- the ribbon itself moves very quickly, backwards and forwards, which can lead to ribbon breaks
- ribbon is consumed at an alarming rate; if you are printing only in blue, say, then it will use up ribbon at more than three times the rate of a black ribbon. Recommended retail price for the ribbons is over £6 a time so this can come expensive.

Does it work? Well, rather to my surprise it does, although there are a lot of qualifications. The first is that selection of suitable paper is quite vital. Not only is the paper feed mechanism not very happy with thick paper but also printing is very much better on a high-gloss paper, rather like the stuff used for the best quality colour brochures.

The thinner it is, the better it feeds. Secondly, the machine is designed for IBM compatibility and not for a BBC but it all works by control and escape codes so no doubt you could overcome this. There is a special BBC screen-dump ROM available: X-DATA promised to send me one but it never arrived. I therefore contented myself with putting the machine through precisely the same test as all the other printers in this review and seeing what it produced.

The machine can handle expanded print, condensed and italic as well as underlining and half height subscripts and superscripts. As the figure shows, the character shapes are clear and quite pleasant. There is a near-letter-quality mode as well as a draft mode.

Perhaps the main drawback to the Okimate is that the paper-feed system is appalling, both in design and construction, and the very poor directions in the handbook do not help you to get the best from it. The result is that it has great difficulty in feeding any but the thinnest paper, paper jams are unavoidable and it takes quite a long time to get any paper in at all. The comparatively low price (recommended retail price £173 plus VAT but you might well get one for less than that) frankly reflects the poor quality of construction.

Conclusions

First: a word about the improvements in printer design and manufacture that have not taken place! All the printers I tested were still very noisy. If you really want a quiet printer, you have to buy a laser or ink-jet machine at ten times the price. All the printers used nine-hammer print heads so that near-letter-quality printing, which demands at least sixteen hammers, can only take place in two passes, which slows the speed down greatly.

When buying a printer look critically at all plastic parts and see if there are any such. If so try and avoid buying it as these will break if anyone drops a book on them!

The Citizen 120-D produced a disappointing quality of print, even in NLQ mode. I thought it had many other faults. The Brother would not do NLQ Italics and the handbook was particularly poor. I liked the Epson LX-86 but it too would not do NLQ Italics; the OKI Microline would not do italics at all as it is only IBM compatible. Mannesman Tally tell me that the MT-80 will do italics but nowhere in the appalling handbook could I find instructions and I never managed to achieve it.

The Star NL-10 was head and shoulders above all the other printers in several respects: robust construction, excellent paper loading, wide range of typefaces including italics and boldfaced italics in NLQ as well as draft, interchangeable interface cartridges, excellent handbook and wide range of modes selectable from a special designed control panel. At a price of £239 plus VAT for the parallel interface version it is by far the best value for money. Its only drawback is that it is noisy: and in short supply!

SKYWATCHER

3

The Moon program completes our suite of astronomy programs for the beginner. You can also learn how astronomers record the position of a celestial body

The Moon

In the Moon program there is a further default variable (height%), which refers to the height in metres above sea-level of the user's home-position.

Co-ordinate Systems

There are two main methods for recording the position of a celestial body — horizon co-ordinates and equatorial co-ordinates.

Horizon Co-ordinates

These give the position of a celestial body as it appears in the sky visible to an observer at a particular location on Earth. The two terms used are altitude and azimuth (see Figure 1).

There is a body at point X. The angle of the body above the True Horizon is XH1. This is the body's altitude. If the altitude is a negative angle this means that the body is below the True Horizon and therefore invisible. Point Y is a body below the True Horizon and

its altitude YH2 is a negative angle.

Points N1 and N2 lie on the meridian of True North and the azimuths of X and Y are XN1 and YN2 respectively, ie the bearings of those bodies from points N1 and N2 measured eastwards from 0 to 360 degrees.

Equatorial Co-ordinates

Again there are two terms for this system — Declination and Right Ascension (see Figure 2).

Imagine that this is a Mercator's Projection star map. That is a map that shows the whole heavens on a flat rectangular surface with the polar regions stretched out longitudinally, and so out of scale. The line AB is the celestial equator, ie an imaginary line projected from the Earth's equator onto the sky as viewed from Earth. The top of Figure 2 is the celestial North Pole, ie the imaginary point of the Earth's North Pole projected up into the heavens as viewed from Earth. Similarly, the bottom of Figure 2 is the celestial South Pole

— an imaginary point projected from the Earth's South Pole. This also means that the half of the total heavens above the celestial equator constitutes the northern celestial hemisphere and the half below, the southern celestial hemisphere.

With this system we can refer to positions in the sky much as we can refer to locations on Earth by means of latitude and longitude. The equivalent of terrestrial latitude is declination. We measure the angle that the centre of body lies above or below the celestial equator. If the body is in the northern celestial hemisphere this angle is positive. If the body lies in the southern celestial hemisphere the angle is negative. In Figure 2 we have the declination of point X as the angle XE1 and that of Y as YE2. The former is positive the latter negative.

The equivalent of terrestrial longitude is right ascension. As on Earth we must measure the angle that the centre of a body lies from a given but arbitrary point. On Earth we use the meridian of Greenwich, in the heavens we use the First Point of Aries. In Figure 2 the meridian of this point is the line FP. The right

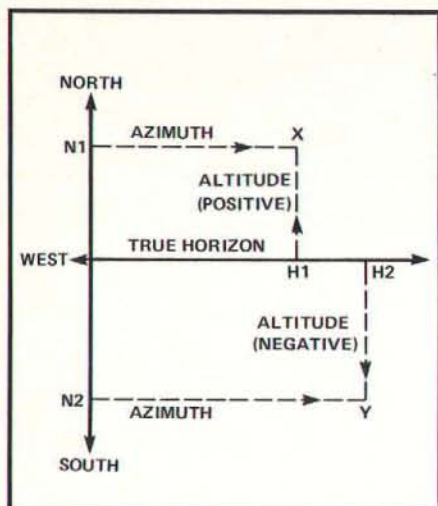


Figure 1

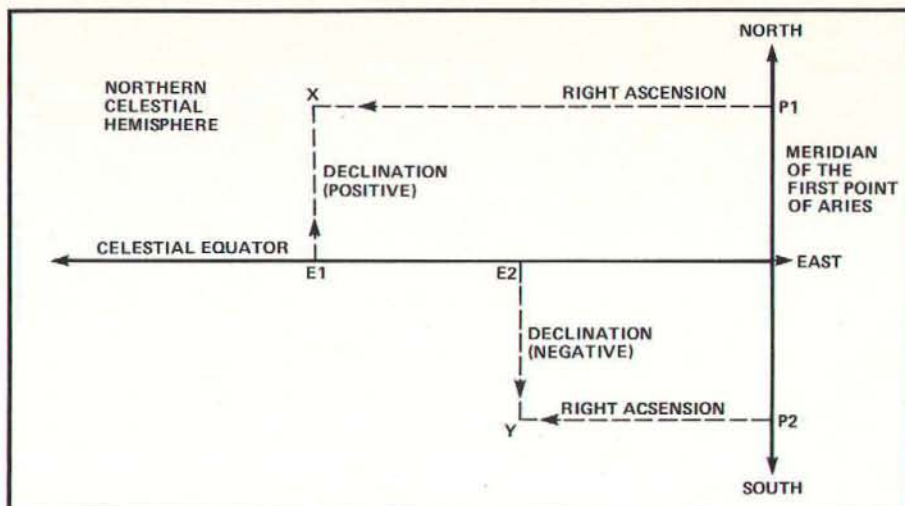


Figure 2

ascensions of the bodies X and Y are the lines XPI and YP2. Right ascension is measured westwards from the First Point of Aries, but, instead of employing degrees of arc, the unit used is the hour (24 hours are equivalent to 360 degrees), and each hour is divided into 60 minutes and each minute into 60 seconds.

This may seem confusing at first until you realise that right ascension is an angle and not a measure of time. Thus a body with a right ascension of 7 hours 25 minutes and 18 seconds lies 111.325 degrees west of the meridian of the First Point of Aries.

There are two other co-ordinate systems in use — ecliptical and galactic. The first takes as its "equator" the path of the ecliptic, the second takes the fundamental plane of the galaxy.

Phase and Position Angle

When viewed from Earth, the moon or any planet may appear as a full disk or a crescent or, like a new moon, it may not be shining at all. This is because the illuminated part is the

visible section of the half of the body's surface that is bathed in light from the sun. The other half is in darkness. Depending upon the angle between the body and the sun, the body will appear to vary its illuminated surface from 0 to 100 percent. This degree of illumination is the body's phase. If the phase is less than 100 percent the surface illuminated will appear as a concave or convex crescent. This surface is termed the body's bright limb, and it may be tilted at an angle from the True Horizon.

This tilting is the position-angle of the body's bright limb (see Figure 3). The circle represents the disk of the moon or a planet. The hatched area is the part in shadow. TB is the projected line of the Earth's north-south axis. Point X is the tip of the top horn of the bright limb; point Y is the tip of the bottom horn. Line CM runs from C, the centre of the disk, to Point M midway along the arc XY. The angle measured anticlockwise from TC to CM, shown by the arrowed line in Figure 3, is the position-angle of the body's bright limb.

Sun's Axis of Rotation

In Figure 4 point C is the centre of the visible disk of the sun. The line RCD is the sun's axis of rotation through C. The dotted line NS represents the position of the Earth's own axis of rotation projected onto the sun's disk. The position-angle of the sun's rotation is the angle A measured anticlockwise from CN to CR.

Disk Menu

The brief menu program holds the suite together for disk users.

Program Entry

The programs in this article have been listed using the A&B Computing Checker. The four digit hexadecimal number in brackets at the end of each line is the "checksum" for that line. It is not to be typed in.

With Checker installed, each program line is assigned a unique checksum when RETURN

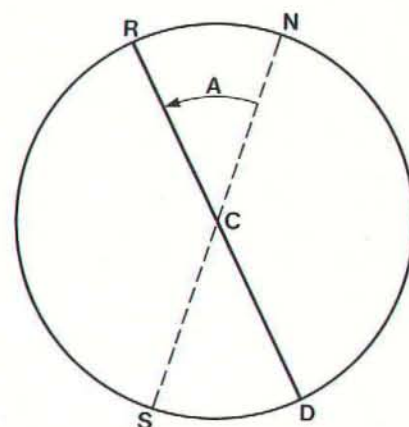


Figure 4

is pressed to enter that line. Compare the checksum number on your screen with that in the magazine to be certain that a line has been correctly entered.

Checker is published periodically in A&B, featured on most Software Sale discs and is available on tape, price £1 (20p p&p). Cheques made payable to Phoenix software.

◆ LISTING 1 ◆

```

10REM ** ASTRONOMY MENU **
(09DD)
20REM ** By S G Stuart ** (
03EB)
30REM ** May 1987 ** (
CF9C)
40ON ERROR IF ERR=17 MODE7:
END ELSE PRINT':REPORT:PRINT"
at line ";ERL:END (2F9D)
50: (E79C)
60MODE7 (A94B)
70VDU23;8202;0;0;0; (BABF)
80: (7069)
90PRINT'CHR#129;STRING$(37,
"*")' (1C76)
100FOR R%=1 TO 2 (FC18)
110PRINT SPC9;CHR#141;CHR#13
4;"ASTRONOMY MENU" (40DE)
    
```

C O N T I N U E S ►

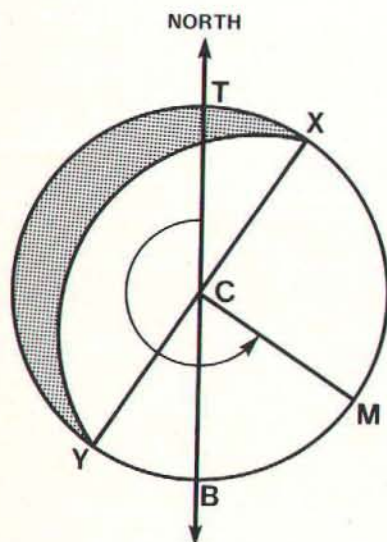


Figure 3

P R O G R A M S / A S T R O N O M Y

```

120NEXT (62F8)
130PRINT 'SPC12;"By S G STUAR
T" (AC4D)
140PRINT 'CHR#129;STRING$(37,
"*")' (C3C1)
150: (2659)
160FOR R%=1 TO 5 (C22F)
170READ prog# (28F8)
180PRINT 'SPC12;CHR#131;CHR#(
64+R%);" " ;prog# (180A)
190NEXT (039B)
200: (36F5)
210PRINT 'SPC3;CHR#132;CHR#15
7;CHR#135;"N.B All azimuths ar
e measured ";CHR#156'SPC9;CHR
#132;CHR#157;CHR#135;"from Tru
e North ";CHR#156 (B725)
220: (8415)
230REPEAT:G#=CHR#(GET AND 22
3):UNTIL INSTR("ABCDE",G#) (B2
AF)
240G%=ASC(G#)-64 (50EC)
250: (2A06)
260IF G%=5 MODE7:END (75CC)
270RESTORE (ECCF)
280FOR R%=1 TO 6% (FADD)
290READ prog# (A0A1)
300NEXT (993D)
310CHAIN prog# (2536)
320: (8020)
330DATA EASTER,SUN,PLANETS,M
OON,QUIT MENU (C899)

```

◆ LISTING 2 ◆

```

10REM ** MOON ** (2B3A)
20REM ** By S G Stuart ** (
03EB)
30REM ** August 1987 ** (
39F7)
40ON ERROR PROCerror:END (4
BD3)
50: (E79C)
60MODE7 (A94B)
70VDU23;B202;0;0;0; (8ABF)
80: (7069)
90PRINT 'SPC9;CHR#135;CHR#14
1;"MOON CALCULATIONS" (BBB4)
100PRINTSPC9;CHR#134;CHR#141
;"MOON CALCULATIONS" (CFD7)
110VDU2B,0,24,39,4 (6C96)
120: (884A)
130REM ** HOME POSITION ** (
4286)
140lat=52.2;hemi#="N";lon=-0
.1;EW#="E";height%=0 (6889)
150: (2659)
160startyear%=1980 (D4A9)
170: (94B9)
180REM Ephemeris Time in day
s (23ED)
190ET=50/60/60/24 (ECB1)
200: (36F5)
210PROCinit (962B)
220PROCplace (8510)
230REPEAT (6619)
240: (7376)
250REPEAT (B06E)
260: (C196)
270PROCcenterdate(startyear%)
(FC89)
280PROCdecide(yr%,mth%,dt%,s
tartyear%) (5107)
290: (E483)
300REPEAT (DCA4)
310PROCcenterGMT(spandays%,da
te$,ET) (F64F)
320: (8020)
330CLS:PRINT TAB(12,8)CHR#13
1;"PLEASE WAIT" (5B91)
340PROCco_ordsun(total,yr%,m
th%,dt%) (102B)
350PROCcalcs(obliquity,total
) (6960)
360PROCparallax(gcentRA,gcen
tDEC,GMT,lon,lat,yr%,mth%,dt%,
height%,MoonCorrectAnom,EQUEN
corct) (62FA)
370PROCdisplay(apRA,apDEC,GM
T$,date$,dist,absdist,horpar,a
ngsize,sunRA,sunDEC,height%,LA
T$,LON%) (0E4C)
380PROChorizon(yr%,mth%,dt%,
GMT,GMT$,lon,lat,LAT$,LON$,apR
A,apDEC,date$,height%) (132F)
390PROCphase(TrueLON,sunLON,
sunRA,sunDEC,apRA,apDEC,GMT$,d
ate$) (FA3E)
400PROCrise_set(spandays%,yr
%,mth%,dt%,lon,lat,height%,LON
$,LAT$,date$) (CF48)
410: (773B)
420CLS:PRINT 'SPC10;CHR#131;
CHR#157;CHR#129;GMT#;CHR#156 (
E1BC)
430PRINT 'SPC1;CHR#134;"Anot
her time on the same date ? Y/
N" (9DEB)
440UNTIL FYesno="N" (0F83)
450: (32B8)
460CLS:PRINT 'SPC10;CHR#132;
CHR#157;CHR#135;date#;CHR#156
(DD95)
470PRINT 'SPC1;CHR#131;"Anot
her date at the same location
?" 'TAB(14)CHR#131;" Y/N" (356
B)
480UNTIL FYesno="N" (C609)
490: (FC3D)
500CLS:PRINT 'SPC4;CHR#131;L
AT#'SPC4;CHR#131;LON#'SPC3;C
HR#134;height%;" metre(s) abov
e sea-level" (063C)
510PRINT 'SPC7;CHR#129;"A di
fferent location ?" 'TAB(14)CH
R#129;" Y/N" (18E2)
520IF FYesno="Y" PROCsetpla
ce:UNTIL FALSE (E54F)
530: (C1EE)
540CHAIN"MENU" (4AEA)
550: (368D)
560DEF FNzero(real):LOCAL A$
(E244)
570A$=STR$(FNdecMToint(real)
) (511A)
580IF A$="" THEN IF SGN(rea
l)=-1 THEN A$="-0" (2893)
590=A$ (FEAF)
600: (2621)
610DEF FNlastdate(yr%,mth%)
(40A8)
620IF mth%=4 OR mth%=6 OR mt
h%=9 OR mth%=11 THEN =30 (86D8
)
630IF mth%<>2 THEN =31 (65D5
)
640IF yr% MOD4<>0 THEN=28 (D
511)
650IF yr% MOD100=0 THEN IF y
r% MOD 400<>0 THEN =28 ELSE =2
9 (3CB9)
660: (D142)
670DEF FNdecMToint(real) (5F
1F)
680=(INT (ABS(real)))*SGN(rea
l) (403D)
690: (F457)
700DEF FNdecMTomin(real) (73
2B)
710=INT((ABS(real)-ABS(FNdec
MToint(real)))*60) (6929)
720: (90F4)
730DEF FNdecMTDsec(real) (62
4D)
740=INT(((ABS(real)-ABS(FNdec
mToint(real)))*60)-FNdecMTomin
(real))*60 (E0A2)
750: (3EE7)
760DEF FNmeanSun(totaldays)
(4F20)
770N=360/365.2422*totaldays
(E555)
780REPEAT (0D4D)
790IF N<0 THEN N=N+360 (292D
)
800UNTIL N>=0 (07AE)
810REPEAT (0505)
820IF N>360 THEN N=N-360 (41
04)
830UNTIL N<=360 (22A4)
840=N (4638)
850: (03C4)
860DEF FNfrom_Epoch(totalday
s) (E2B9)
870LOCAL kappa,pos,guess,exi
t,delta,true_anom,nextpart (BF
03)
880kappa=FNmeanSun(totaldays
)+Eg-Wg (28B7)
890IF kappa<0 kappa=kappa+36
0 (5842)
900guess=RAD(kappa) (E26E)
910REPEAT (44A2)
920delta=guess-eccentricity*
SIN(guess)-RAD(kappa) (FF21)
930exit=ABS(delta)<10E-6 (EC
A1)
940IF NOT exit THEN nextpart
=delta/(1-eccentricity*COS(gue
ss)) (C349)
950IF NOT exit THEN guess=gu
ess-nextpart (9322)
960UNTIL exit (131A)
970: (B511)
980pos=SQR((1+eccentricity)/
(1-eccentricity))*TAN(guess/2)
(FD56)
990true_anom=2*ATN(pos) (BA2
A)
1000=DEG(true_anom) (B1FA)
1010: (D501)
1020DEF FNsunEclpLong(totalda
ys) (B62D)
1030lambda=FNfrom_Epoch(total
days)+Wg (8639)
1040IF lambda>360 lambda=lamb
da-360 ELSE IF lambda<0 lambda
=lamba+360 (EB36)
1050=lambda (B876)
1060: (7B12)
1070DEF FN_RA_eclplatlon(lamb
da,beta,obliquity) (7C43)
1080LOCAL A,B,theta (E501)
1090A=SIN(RAD(lambda))*COS(RA
D(obliquity))-TAN(RAD(beta))*S
IN(RAD(obliquity)) (009E)
1100B=COS(RAD(lambda)) (E032)
1110theta=DEG(ATN(A/B)) (AFF0
)
1120alpha=FNadjust(A,B,theta)
(712B)
1130=alpha/15 (9ABE)
1140: (CDC7)
1150DEF FN_DEC_eclplatlon(lam
bda,beta,obliquity) (AE39)
1160=DEG(ASN(SIN(RAD(beta))*C
OS(RAD(obliquity))+COS(RAD(bet
a))*SIN(RAD(obliquity))*SIN(RA
D(lambda))) (E1F5)
1170: (2657)
1180DEF FNsldconstB(yr%) (D3C
4)
1190LOCAL JD,S,T,R (8B61)
1200JD=FNjuliandate(yr%,1,0,0
) (037B)

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MODEL B / B + / MASTER 128 / COMPACT

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12105=JD-2415020.0 (5F59)
1220T=S/36525.0 (0071)
1230R=6.6460656+(2400.051262*
T)+(0.00002581*T^2) (D511)
1240=24-(R-(24*(yr%-1900))) (
CBFF)
1250: (98E8)
1260DEF FN1stTQgmt(LST,lon,yr
%,mth%,dt%) (8BB4)
1270LOCAL run%,gonedays%,from
days%,GST,A,C,D,y (BFFA)
1280GST=LST+(lon/15) (D095)
1290IF GST>24 GST=GST-24 ELSE
IF GST<0 GST=GST+24 (A0C6)
1300: (802E)
1310gonedays%=0 (5E44)
1320FOR run%=1 TO mth%-1 (745
6)
1330gonedays%=gonedays%+FN1as
tdate(yr%,run%) (237D)
1340NEXT (2A79)
1350IF mth%=1 THEN gonedays%=
0 (9C31)
1360: (774D)
1370fromdays%=dt%+gonedays% (
72CA)
1380A=0.0657098:C=1.002738:D=
0.997270 (44C4)
1390y=(fromdays%*A)-FNsidcons
tB(yr%) (DCCA)
1400IF y<0 y=y+24 (08FE)
1410P=GST-y (22A9)
1420IF P<0 P=P+24 (72AD)
1430=P*D (CD6E)
1440: (D926)
1450DEF FNraTOhrANGLE(LST,RA)
(AC01)
1460HRA=LST-RA (E99B)
1470IF HRA<0 HRA=HRA+24 (415B
)
1480=HRA (3A04)
1490: (4ED3)
1500DEF FNquatTOalt(HRangle,
DEC,lat) (2E8C)
1510=DEG(ASN((SIN(RAD(DEC))*S
IN(RAD(lat)))+(COS(RAD(DEC))*C
OS(RAD(lat))*COS(RAD(HRangle*1
5)))) (B9EE)
1520: (2A70)
1530DEF FNquatTOazm(altitude
,DEC,lat,LST,RA) (165F)
1540LOCAL test (B736)
1550test=(SIN(RAD(DEC))-(SIN(
RAD(lat))*SIN(RAD(altitude))))
/(COS(RAD(lat))*COS(RAD(altitu
de))) (61DF)
1560IF test<-1 test=-1 ELSE I
F test>1 test=1 (BE3A)
1570azimuth=DEG(ACS(test)) (D
B14)
1580IF SIN(RAD(FNraTOhrANGLE(
LST,RA)*15))>0 THEN azimuth=36
0-azimuth (A7CA)
1590=azimuth (39A1)
1600: (94CF)
1610DEF FNgmtTO1st(GMT,yr%,mt
h%,dt%,lon) (5C14)
1620LOCAL A,C,pastdays%,year
days%,GST,run% (6D6F)
1630A=0.0657098:C=1.002738 (9
66B)
1640pastdays%=0 (5ECB)
1650: (883C)
1660FOR run%=1 TO mth%-1 (0FD
D)
1670pastdays%=pastdays%+FN1as
tdate(yr%,run%) (BC1C)
1680NEXT (3AD0)
1690IF mth%=1 pastdays%=0 (52
0E)
1700: (90FA)
1710yeardays%=pastdays%+dt% (
6191)
1720GST=(GMT*C)+(yeardays%*A-
FNsidconstB(yr%)) (14E7)
1730IF GST>24 GST=GST-24 ELSE
IF GST<0 GST=GST+24 (B525)
1740locsid=GST-(lon/15) (C709
)
1750IF locsid>24 locsid=locsi
d-24 ELSE IF locsid<0 locsid=1
ocsid+24 (B4BB)
1760=locsid (2C05)
1770: (3EE9)
1780DEF FNelongation(sunRA,su
nDEC,RA,DEC) (A945)
1790=DEG(ACS(SIN(RAD(DEC))*SI
N(RAD(sunDEC))+COS(RAD((RA-sun
RA)*15))*COS(RAD(sunDEC))*COS(
RAD(DEC)))) (A78E)
1800: (ADD9)
1810DEF PROCplace (ACB9)
1820CLS (E58D)
1830LAT$="Latitude "+STR$(AB
S(FNdecmtoint(lat))+" deg "+S
TR$(FNdecmtomin(lat))+" min "+
hemi$+" " (DAC8)
1840LON$="Longitude "+STR$(AB
S(FNdecmtoint(lon))+" deg "+S
TR$(FNdecmtomin(lon))+" min "+
EW$+" " (E5BD)
1850PRINT''SPC6;CHR#134"Loca
tions are set for''SPC4;CHR#1
31;LAT$''SPC4;CHR#131;LON$ (03
AB)
1860PRINT''SPC3;CHR#130;"At "
;height%;" metre(s) above sea-
level''SPC6;"Want to change
them ? Y/N" (8B25)
1870IF FNyesno="N" ENDPROC EL
SE PROCsetplace:ENDPROC (0B2D)
1880: (26DF)
1890DEF PROCsetplace (FFA0)
1900LOCAL lat%,latmin%,lon%,l
onmin% (CD93)
1910CLS (3C3A)
1920PRINT''SPC3;CHR#131;"Lat
itude North or South N/S" (C
9B5)
1930REPEAT:hemi$=CHR$(GET AND
223) (DCB8)
1940UNTIL INSTR("NS",hemi$) (
1949)
1950REPEAT:CLS (5473)
1960PRINT''CHR#148;CHR#157;CH
R#131;"Latitude ";hemi$;" ";CH
R#156 (EASF)
1970INPUT''SPC4;"Enter latitu
de degrees only (0-84)''SPC6;
lat% (2073)
1980UNTIL lat%>=0 AND lat%<=8
4 (7679)
1990REPEAT:CLS (5659)
2000PRINT''CHR#148;CHR#157;CH
R#131;"Latitude ";hemi$;" ";la
t%;" deg ";CHR#156 (FCB0)
2010INPUT''SPC4;"Enter latitu
de minutes only (0-59)''SPC6;
latmin% (B2D7)
2020UNTIL latmin%>=0 AND latm
in%<=59 (D9E2)
2030lat=lat%+latmin%/60 (D44E
)
2040IF hemi$="S" THEN lat=-la
t (C27C)
2050LAT$="Latitude "+STR$(AB
S(lat%))+" deg "+STR$(latmin%)
+" min "+hemi$+" " (E5BB)
2060CLS:PRINT'CHR#131;LAT$ (9
16B)
2070PRINT''SPC4;CHR#131;"Long
itude East or West ? E/W" (537
D)
2080REPEAT:EW$=CHR$(GET AND22
3) (CB1C)
2090UNTIL INSTR("EW",EW$) (C9
5B)
2100: (7413)
2110REPEAT:CLS (7EBB)
2120PRINT''CHR#151;CHR#157;CH
R#132;"Longitude ";EW$;" ";CHR
#156 (FB56)
2130INPUT''SPC2;"Enter longit
ude degrees only (0-180)''SPC
6;lon% (27F2)
2140UNTIL lon%>=0 AND lon%<=1
80 (30CB)
2150REPEAT:CLS (7F5D)
2160PRINT''CHR#151;CHR#157;CH
R#132;"Longitude ";EW$;" "lon%
;" deg ";CHR#156 (EF95)
2170INPUT''SPC2;"Enter longit
ude minutes only (0-59)''SPC6
;lonmin% (64A4)
2180UNTIL lonmin%>=0 AND lonm
in%<=59 AND (lon%+lonmin%/60)<
=180 (AAB9)
2190lon=lon%+lonmin%/60 (479B
)
2200IF EW$="E" lon=-lon (FF74
)
2210LON$="Longitude "+STR$(AB
S(lon%))+" deg "+STR$(lonmin%)
+" min "+EW$+" " (826F)
2220REPEAT:CLS (6490)
2230PRINT''CHR#131;CHR#157;CHR
#132;LAT$;" ";CHR#156 (B7E1)
2240PRINT''CHR#131;CHR#157;CHR
#132;LON$;" ";CHR#156 (F16B)
2250INPUT'' Enter height abo
ve sea-level''SPC5;"in metres
(0 to 10000)''SPC10;height%
(4B07)
2260UNTIL height%>=0 AND heig
ht%<=10000 (51EA)
2270CLS:PRINT TAB(4,5)CHR#129
;LAT$''TAB(4)CHR#129;LON$''SP
C3;CHR#134;height%;" metre(s)
above sea-level" (84D6)
2280PRINT''SPC11;CHR#131;"OK
? Y/N" (CE48)
2290IF FNyesno="N" PROCsetpla
ce (44B7)
2300ENDPROC (C75F)
2310: (2509)
2320DEF PROCcenterdate(startye
ar%) (0546)
2330REPEAT:CLS (8D48)
2340PRINT''Enter the year ("
;startyear%-25;" - ";startyear
%+35;" ) (0EDC)
2350INPUT''SPC5;yr% (F046)
2360UNTIL yr%>=startyear%-25
AND yr%<=startyear%+35 (2124)
2370REPEAT:CLS (8CAE)
2380PRINT''CHR#131"YEAR : ";yr
%'' (870C)
2390INPUT''Enter the month (1
-12)''SPC9;mth% (69EF)
2400UNTIL mth%>=1 AND mth%<=1
2 (9532)
2410REPEAT:CLS (C178)
2420PRINT''CHR#131"YEAR : ";y
r%''CHR#131;"MONTH : ";MTH$(m
th%);(No ";mth%;" )'' (02BC)
2430PRINT''Enter the date (1
to ";FN1astdate(yr%,mth%);)"
(CF42)
2440INPUT''SPC9;dt% (C4B2)
2450UNTIL dt%>=1 AND dt%<=FN1
astdate(yr%,mth%) (EE63)
2460date$="On "+STR$(dt%)+ "
+MTH$(mth%)+ " "+STR$(yr%)+ " "

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C O N T I N U E S ►

P R O G R A M S / A S T R O N O M Y

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(FFC4)
2470ENDPROC (4AA4)
2480: (EBF4)
2490DEF PROCdecide(yr%,mth%,d
t%,startyear%) (EB8D)
2500IF yr%>startyear% THEN s
pandays%=FNpastdaytotal(yr%,m
h%,dt%,startyear%) ELSE spanda
ys%=FNforedaytotal(yr%,mth%,d
t%,startyear%) (06D9)
2510ENDPROC (5AED)
2520: (D627)
2530DEF PROCcenterGMT(totalday
s%,date$,ET) (DC6F)
2540LOCAL HR%,MIN% (7AB8)
2550REPEAT:CLS (B91E)
2560PRINT'CHR#131;date$ (ACA1
)
2570INPUT' SPC2;"Enter the ho
ur of day GMT (0-23) "' SPC9;HR
% (7395)
2580UNTIL HR%>=0 AND HR%<=23
(5B8A)
2590REPEAT:CLS (BB34)
2600PRINT'CHR#131;date$;" GMT
HR ";HR% (C6FB)
2610INPUT' "Enter the minutes
of the day (0-59) "' SPC9;MIN%
(A769)
2620UNTIL MIN%>=0 AND MIN%<=5
9 (D751)
2630GMT$="At "+FNwriteGMT(HR%
,MIN%) (1488)
2640total=totaldays%+ET+(HR%+
MIN%/60)/24 (2185)
2650GMT=(HR%+MIN%/60)+ET*24:E
NDPROC (9961)
2660: (9FFB)
2670DEF FNangleobliquity(yr%,
mth%,dt%,GMT) (1DEF)
2680LOCAL JD,T,ob (6628)
2690JD=FNjuliandate(yr%,mth%,
dt%,GMT) (ABAE)
2700T=(JD-2415020.0)/36525.0
(CE1E)
2710ob=(46.845*T+0.0059*T^2-0
.00181*T^3)/3600 (EFBD)
2720=23.452294-ob (597C)
2730: (B73D)
2740DEF PROCcalcs(obliquity,t
otaldays) (CEFO)
2750LOCAL sunMeanAnom,Moonmea
nLON,ascNODMEANLON,Correct,Eve
ct,AnEQU,Corct3,Corct4,CORRECT
ion,Var,NODEcorLON,A,B,gamma (
13B6)
2760: (9BCE)
2770REM Moon Data (DE74)
2780epochlon=64.975464 (ACE6)
2790Per=349.383063 (7D9E)
2800Node=151.950429 (9CA3)
2810inc=5.145396 (B012)
2820lunarEC=0.054900 (C4FC)
2830asz=0.5181 (4061)
2840axm=384401 (2E6A)
2850par=0.9507 (2329)
2860: (A6ED)
2870REM Sun Data (1B8C)
2880Eg=278.833540 (5B1A)
2890Wg=282.596403 (94A2)
2900eccentricity=0.016718 (B0
57)
2910: (0CCB)
2920sunLON=FNsunEclpLong(tota
ldays) (DBB8)
2930sunMeanAnom=FNmeanSun(tot
aldays)+Eg-Wg (C3F5)
2940MoonmeanLON=13.1763966*to
taldays+epochlon (2454)
2950REPEAT (55E8)
2960IF MoonmeanLON>360 THEN M
oonmeanLON=MoonmeanLON-360 (66
3A)
2970UNTIL MoonmeanLON<=360 (D
F5E)
2980: (DEBD)
2990REPEAT (D945)
3000IF MoonmeanLON<0 THEN Moo
nmeanLON=MoonmeanLON+360 (62D1
)
3010UNTIL MoonmeanLON>0 (A779
)
3020: (76CA)
3030MOONmeanANOM=MoonmeanLON-
0.111404*totaldays-Per (ABA1)
3040REPEAT (BADF)
3050IF MOONmeanANOM>360 THEN
MOONmeanANOM=MOONmeanANOM-360
(409E)
3060UNTIL MOONmeanANOM<=360 (
FAC1)
3070: (6A39)
3080REPEAT (3672)
3090IF MOONmeanANOM<0 MOONmea
nANOM=MOONmeanANOM+360 (748B)
3100UNTIL MOONmeanANOM>0 (FC3
B)
3110: (996F)
3120ascNODMEANLON=Node-0.0529
539*totaldays (995B)
3130REPEAT (7BF9)
3140IF ascNODMEANLON>360 THEN
ascNODMEANLON=ascNODMEANLON-3
60 (1974)
3150UNTIL ascNODMEANLON<360 (
B306)
3160: (377C)
3170REPEAT (0062)
3180IF ascNODMEANLON<0 THEN a
scNODMEANLON=ascNODMEANLON+360
(EA59)
3190UNTIL ascNODMEANLON>0 (DE
4F)
3200: (CC40)
3210Correct=MoonmeanLON-sunLO
N (B03E)
3220Evect=1.2739*SIN(RAD(2*Co
rrect-MOONmeanANOM)) (634B)
3230AnEQU=0.1858*SIN(RAD(sunM
eanAnom)) (EB38)
3240Corct3=0.37*SIN(RAD(sunMe
anAnom)) (9597)
3250MoonCorrectAnom=MOONmeanA
NOM+Evect-AnEQU-Corct3 (57C4)
3260EQUENCorct=6.2886*SIN(RA
D(MoonCorrectAnom)) (AEE2)
3270Corct4=0.214*SIN(RAD(2*Mo
onCorrectAnom)) (ASD6)
3280CORRECTIon=MoonmeanLON+Ev
ect+EQUENCorct-AnEQU+Corct4 (
15AF)
3290Var=0.6583*SIN(RAD(2*(COR
RECTIon-sunLON))) (92A1)
3300TrueLON=CORRECTIon+Var (6
C0A)
3310: (9105)
3320NODEcorLON=ascNODMEANLON-
0.16*SIN(RAD(sunMeanAnom)) (8F
49)
3330: (23E5)
3340A=SIN(RAD(TrueLON-NODEcor
LON))*COS(RAD(inc)) (19BF)
3350B=COS(RAD(TrueLON-NODEcor
LON)) (7C3D)
3360gamma=DEG(ATN(A/B)) (CBAE
)
3370gamma=FNadjust(A,B,gamma)
(D2B2)
3380: (4373)
3390ECLPlon=gamma+NODEcorLON
(BFCA)
3400ECLPlat=DEG(ASN(SIN(RAD(T
rueLON-NODEcorLON))*SIN(RAD(in
c)))) (3D4B)
3410: (8DBE)
3420gcentRA=FN_RA eclplaton(
ECLPlon,ECLPlat,obliquity) (8E
11)
3430gcentDEC=FN_DEC_eclplato
n(ECLPlon,ECLPlat,obliquity) (
9921)
3440: (917D)
3450ENDPROC (1849)
3460: (239D)
3470DEF PROCdisplay(RA,DEC,GM
T$,date$,dist,absdist,horpar,a
ngsize,sunRA,sunDEC,height%,LA
T$,LON%) (A226)
3480LOCAL elong (308D)
3490CLS (3033)
3500: (D0CB)
3510PRINT SPC3;CHR#129;CHR#15
7;CHR#135;LAT%;CHR#156'SPC3;CH
R#129;CHR#157;CHR#135;LON%;CHR
#156'SPC3;CHR#129;CHR#157;CHR#
135;height%;" metre(s) above s
ea-level ";CHR#156 (5503)
3520PRINT' SPC3;CHR#131;date$;
SPC2;GMT$ (FFEE)
3530PRINT' SPC10;CHR#134;"With
Parallax" (C07F)
3540PRINT "Right ascension is
";FNdecMToint(RA);" hr ";FNde
cmTomin(RA);" min ";FNdecMTose
c(RA);" sec" (D7F6)
3550PRINT "Declination is ";F
Nzoro(DEC);" deg ";FNdecMTomin
(DEC);" min ";FNdecMTosec(DEC)
;" sec" (C2CA)
3560: (27A8)
3570PRINT "Geocentric distanc
e is ";INT(dist);" km" (4CED)
3580: (5BCD)
3590PRINT "Angular size is ";
FNdecMToint(angsize);" deg ";F
NdecMTomin(angsize);" min ";FN
decMTosec(angsize);" sec" (9BC
5)
3600PRINT "Horiz'al parallax
=" ";FNdecMToint(horpar);" deg
";FNdecMTomin(horpar);" min ";
FNdecMTosec(horpar);" sec" (5B
42)
3610: (85E4)
3620elong=FNelongation(sunRA,
sunDEC,RA,DEC) (5F92)
3630PRINT "Elongation is ";FN
decMToint(elong);" deg ";FNdec
mTomin(elong);" min ";FNdecMTO
sec(elong);" sec" (7CBF)
3640: (9917)
3650PROCcontinue (3319)
3660ENDPROC (9153)
3670: (7287)
3680DEF PROCphase(TrueLON,sun
LON,sunRA,sunDEC,RA,DEC,GMT$,d
ate$) (B6D0)
3690LOCAL @%,A$,phase,phase%,
age,A,B,alpha (2E18)
3700CLS (EB30)
3710PRINT'CHR#134;date$;SPC1;
CHR#135;CHR#157;CHR#132;GMT$;C
HR#156 (5370)
3720age=(TrueLON-sunLON)/12 (
FEF9)
3730IF SGN(age)=-1 THEN age=3
0-ABS(age) (1957)
3740phase=(1-COS(RAD(TrueLON-
sunLON)))*0.5 (25E7)
3750phase%=INT(phase*100+0.5)
(4308)
3760IF phase%=100 THEN A$="FU
LL" ELSE IF phase%=0 THEN A$="
NEW" ELSE IF age<15 THEN A$="W
AXING" ELSE A$="WANING" (A63E)
3770@%=%020109 (721B)

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MODEL B/DFS/MASTER I28/COMPACT

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3780PRINT 'CHR#132;CHR#157;CHR
R#131;age;" day(s) after New M
oon ";CHR#156 (F6B9)
3790E%=&#90A (41D5)
3800PRINT 'CHR#135;CHR#157;CHR
#132;A#;" MOON ";CHR#156 (CF99
)
3810PRINT 'CHR#131;CHR#157;CH
R#132;"Surface illuminated is
";phase%;"% ";CHR#156 (EF2C)
3820: (5762)
3830A=COS(RAD(sunDEC))*SIN(RA
D((sunRA-RA)*15)) (F138)
3840B=COS(RAD(DEC))*SIN(RAD(s
unDEC))-SIN(RAD(DEC))*COS(RAD(
sunDEC))*COS(RAD((sunRA-RA)*15
)) (97B8)
3850alpha=DEG(ATN(A/B)) (082E
)
3860alpha=FNadjust(A,B,alpha)
(55BA)
3870: (4B91)
3880PRINT 'CHR#131;"The positi
on-angle of the moon's" 'SPC6;
CHR#131;"bright limb is" (F68C
)
3890PRINT 'CHR#131;SPC8;INT(al
pha);" deg" (9BE3)
3900PROCcontinue (6B27)
3910ENDPROC (1327)
3920: (5357)
3930DEF PROCco_ordsun(totalda
ys,yr%,mth%,dt%) (DC9B)
3940PROCsuninit (D117)
3950obliquity=FNangleobliquit
y(yr%,mth%,dt%,GMT) (DC3D)
3960SUNeclplon=FNsunEclpLong(
totaldays) (1CA6)
3970sunRA=FN_RA_eclplaton(SU
Necplon,0,obliquity) (4EA7)
3980sunDEC=FN_DEC_eclplaton(S
UNecplon,0,obliquity) (E1FE)
3990ENDPROC (5E99)
4000: (ABCB)
4010DEF PROCsuninit (276A)
4020Eg=278.833540 (723B)
4030Wg=282.596403 (BE83)
4040eccentricity=0.016718 (84
41)
4050ENDPROC (FB40)
4060: (5FAB)
4070DEF PROCChorizon(yr%,mth%,
dt%,GMT,GMT$,lon,lat,LAT$,LON$,
RA,DEC,date$,height%) (824B)
4080LOCAL LST,hrANGLE,azm,alt
(BE71)
4090LST=FNgmtTO1st(GMT,yr%,mt
h%,dt%,lon) (0CF4)
4100hrANGLE=FNraTOhrANGLE(LST
,RA) (D3C4)
4110alt=FNquatTOalt(hrANGLE,
DEC,lat) (C788)
4120azm=FNquatTOazm(alt,DEC,
lat,LST,RA) (15EB)
4130CLS (F34B)
4140PRINT CHR#135;CHR#157;CHR
#132;LAT$;CHR#156 (2545)
4150PRINT 'CHR#135;CHR#157;CHR
#132;LON$;CHR#156 (83B5)
4160PRINT 'CHR#129;CHR#157;CHR
#135;height%;" metre(s) above
sea-level ";CHR#156 (09C9)
4170PRINT 'CHR#131;CHR#157;CH
R#132;date$;CHR#156;SPC2;CHR#1
32;CHR#157;CHR#131;GMT$;CHR#15
6 (4B19)
4180PRINT ' "Altitude ";FNzero
(alt);" deg ";FNdecMTomin(alt)
;" min ";FNdecMTosec(alt);" se
c" (0E3B)
4190PRINT ' "Azimuth ";FNdecM
TOint(azm);" deg ";FNdecMTomin
(azm);" min ";FNdecMTosec(azm)
;" sec" (10BD)
4200PROCcontinue (5D99)
4210ENDPROC (966C)
4220: (1241)
4230DEF PROCrise_set(spandays
%,yr%,mth%,dt%,lon,lat,height%,
LON$,LAT$,date$) (D05C)
4240LOCAL MIDNIGHT,NOON,midni
ghtRA,midnightDEC,noonRA,noonD
EC,angsizeMDNT,angsizeNOON (2B
68)
4250LOCAL noonLSTr,noonLSTs,m
idnightLSTr,midnightLSTs,Tr,Ts
,avDEC,Rising,Setting,gmtR,gmt
S (E1BA)
4260CLS (B9D2)
4270PRINT TAB(12,8)CHR#132;CH
R#157;CHR#135;"PLEASE WAIT ";C
HR#156 (A05D)
4280: (2BA7)
4290MIDNIGHT=spandays% (CC9B)
4300NOON=MIDNIGHT+0.5 (E4ED)
4310: (FDE4)
4320PROCcalcs(FNangleobliquit
y(yr%,mth%,dt%,0),MIDNIGHT) (A
2F3)
4330PROCparallax(gcentRA,gcen
tDEC,0,lon,lat,yr%,mth%,dt%,he
ight%,MoonCorrectAnom,EQUCENCo
rct) (47EF)
4340angsizeMDNT=angsize (512E
)
4350midnightRA=apRA (6D47)
4360midnightDEC=apDEC (B120)
4370: (0A87)
4380IF NOT FNcheck(midnightDE
C,lat) THEN PROCnone(date$,LAT
$,LON$,height%):ENDPROC (6716)
4390: (76E2)
4400midnightLSTr=FN1str(lat,m
idnightDEC,midnightRA) (A90E)
4410midnightLSTs=FN1sts(lat,m
idnightDEC,midnightRA) (17AB)
4420: (0AFF)
4430PROCcalcs(FNangleobliquit
y(yr%,mth%,dt%,12),NOON) (3D6B
)
4440PROCparallax(gcentRA,gcen
tDEC,12,lon,lat,yr%,mth%,dt%,h
eight%,MoonCorrectAnom,EQUCENC
orct) (D944)
4450angsizeNOON=angsize (CA93
)
4460noonRA=apRA (CB75)
4470noonDEC=apDEC (1FE5)
4480: (3319)
4490IF NOT FNcheck(noonDEC,la
t) THEN PROCnone(date$,LAT$,LO
N$,height%):ENDPROC (EF11)
4500: (BC2A)
4510noonLSTr=FN1str(lat,noonD
EC,noonRA) (D14B)
4520noonLSTs=FN1sts(lat,noonD
EC,noonRA) (9591)
4530: (57BA)
4540Tr=12.03*midnightLSTr/(12
.03+midnightLSTr-noonLSTr) (5B
4B)
4550Ts=12.03*midnightLSTs/(12
.03+midnightLSTs-noonLSTs) (05
F3)
4560: (4B49)
4570avDEC=(midnightDEC+noonDE
C)/2 (5B9A)
4580avANGsize=(angsizeNOON+an
gsizemDNT)/2 (9D0D)
4590Rising=Tr-FNrefraction(la
t,avDEC,avANGsize)/3600 (B431)
4600Setting=Ts+FNrefraction(l
at,avDEC,avANGsize)/3600 (2DDB
)
4610: (E905)
4620gmtR=FN1stTOgmt(Rising,lo
n,yr%,mth%,dt%) (4441)
4630gmtS=FN1stTOgmt(Setting,1
on,yr%,mth%,dt%) (81C0)
4640: (F5F6)
4650PROCazmRISESET(avANGsize,
avDEC,lat) (08B3)
4660: (4716)
4670CLS:PRINT SPC3;CHR#134;"W
ith parallax and refraction" (
F0BA)
4680PRINT CHR#135;CHR#157;CHR
#132;LAT$;CHR#156 (17C2)
4690PRINT 'CHR#135;CHR#157;CHR
#132;LON$;CHR#156 (B132)
4700PRINT 'CHR#131;CHR#157;CHR
#132;height%;" metre(s) above
sea-level ";CHR#156 (8B58)
4710PRINT 'CHR#129;CHR#157;CHR
#135;date$;CHR#156 (0F53)
4720IF gmtR<gmtS THEN PROCris
e(ArNEW,gmtR):PROCset(AsNEW,gm
tS) ELSE PROCset(AsNEW,gmtS):P
ROCrise(ArNEW,gmtR) (1C4D)
4730: (5FD0)
4740PROCcontinue (38BF)
4750ENDPROC (92BD)
4760: (4323)
4770DEF PROCrise(ArNEW,gmtR)
(10CB)
4780PRINT 'CHR#132;CHR#157;CHR
#135;"MOONRISE ";CHR#156 (E788
)
4790PRINT 'CHR#131;FNwriteGMT(
FNdecMToint(gmtR),FNdecMTomin(
gmtR)) (5573)
4800PRINT CHR#131;"Azimuth ";
FNdecMToint(ArNEW);" deg ";FNd
ecMTomin(ArNEW);" min" (7773)
4810ENDPROC (D210)
4820: (3883)
4830DEF PROCset(AsNEW,gmtS) (
CB95)
4840PRINT 'CHR#135;CHR#157;CHR
#132;"MOONSET ";CHR#156 (7BB7
)
4850PRINT 'CHR#131;FNwriteGMT(
FNdecMToint(gmtS),FNdecMTomin(
gmtS)) (8DE6)
4860PRINT CHR#131;"Azimuth ";
FNdecMToint(AsNEW);" deg ";FNd
ecMTomin(AsNEW);" min" (1DF6)
4870ENDPROC (77B1)
4880: (0265)
4890DEF FN1str(lat,DEC,RA) (C
619)
4900LOCAL H (D014)
4910H=1/15*DEG(ACS(-1*TAN(RAD
(lat))*TAN(RAD(DEC)))) (30F3)
4920LSTr=24+RA-H (43C0)
4930IF LSTr>24 THEN LSTr=LSTr
-24 (7C0C)
4940=LSTr (A612)
4950: (91A5)
4960DEF FN1sts(lat,DEC,RA) (D
0CD)
4970LOCAL H (3422)
4980H=1/15*DEG(ACS(-1*TAN(RAD
(lat))*TAN(RAD(DEC)))) (8CC6)
4990LSTs=RA+H (2AB2)
5000IF LSTs>24 THEN LSTs=LSTs
-24 (7962)
5010=LSTs (EE5C)
5020: (AE27)
5030DEF FNdaystweenyrs(yr%,st
artyear%) (5248)
5040LOCAL run% (B129)
5050IF yr%=startyear% THEN =0

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C O N T I N U E S ►

P R O G R A M S / A S T R O N O M Y

```

(C52B)
5060sum%=0 (69B2)
5070FOR run%=startyear% TO yr
%-1 (2FC0)
5080IF run% MOD 4<>0 THEN sum
%=sum%+365 ELSE IF run% MOD 10
0=0 AND run% MOD400<>0 sum%=su
m%+365 ELSE sum%=sum%+366 (B3D
E)
5090NEXT (94E7)
5100=sum% (F23F)
5110: (41B2)
5120DEF FNrefraction(lat,DEC,
angsize) (1E52)
5130LOCAL PSI,R,X,Y (C4B9)
5140PSI=DEG(ACS(SIN(RAD(lat))
/COS(RAD(DEC)))) (2D33)
5150R=0.566667:REM ** R is ho
rizon index of refraction (1FC
B)
5160X=R+angsize/2 (9767)
5170Y=DEG(ASN(SIN(RAD(X))/SIN
(RAD(PSI)))) (E993)
5180REM ** equals time in sec
onds (278B)
5190=240*Y/COS(RAD(DEC)) (A25
E)
5200: (14AD)
5210DEF FNpastdaytotal(yr%,mt
h%,dt%,startyear%) (BF0B)
5220LOCAL T%,run% (C726)
5230add%=FNdaystweenyrs(yr%,s
tartyear%) (3DBF)
5240IF mth%=1 THEN add%=add%+
dt%:=add% (2BA1)
5250T%=0 (C781)
5260FOR run%=1 TO mth%-1 (F3F
A)
5270T%=T%+FN1astdate(yr%,run%
) (A583)
5280NEXT (0102)
5290=add%+T%+dt% (C7D0)
5300: (109B)
5310DEF FNforedaytotal(yr%,mt
h%,dt%,startyear%) (28B3)
5320LOCAL T%,run% (BA05)
5330add%=FNdaystweenyrs(start
year%,yr%) (BC7C)
5340add%=-add% (55E9)
5350IF mth%=1 THEN add%=add%+
dt%:=add% (BD52)
5360T%=0 (6182)
5370FOR run%=1 TO mth%-1 (524
1)
5380T%=T%+FN1astdate(yr%,run%
) (99F3)
5390NEXT (ECC1)
5400=add%+T%+dt% (EF7A)
5410: (5563)
5420DEF FNparlxRA(height%,lat
,HRangle,dist,RA,DEC) (DB5D)
5430LOCAL U,pcostheta,psinthe
ta,r,diff (F9C0)
5440: (4990)
5450U=DEG(ATN(0.996647*TAN(RA
D(lat)))) (CFCE)
5460pcostheta=COS(RAD(U))+ (he
ight%/6378140)*COSRAD(lat) (37
73)
5470psintheta=0.996647*SIN(RA
D(U))+ (height%/6378140)*SIN(RA
D(lat)) (0D9D)
5480r=dist/6378.16 (6B19)
5490diff=DEG(ATN(pcostheta*SI
N(RAD(HRangle*15))/(r*COS(RAD(
DEC))-pcostheta*COS(RAD(HRangl
e*15)))) (60CD)
5500parRA=RA-diff/15 (63BF)
5510=parRA (14EE)
5520: (BAC6)
5530DEF FNparlxDEC(height%,la
t,HRangle,dist,RA,DEC) (B471)
5540LOCAL U,pcostheta,psinthe
ta,r,diff,newHR,A (69A9)
5550: (14D5)
5560U=DEG(ATN(0.996647*TAN(RA
D(lat)))) (6E4E)
5570pcostheta=COS(RAD(U))+ (he
ight%/6378140)*COSRAD(lat) (22
51)
5580psintheta=0.996647*SIN(RA
D(U))+ (height%/6378140)*SIN(RA
D(lat)) (BBDC)
5590r=dist/6378.16 (496F)
5600diff=DEG(ATN(pcostheta*SI
N(RAD(HRangle*15))/(r*COS(RAD(
DEC))-pcostheta*COS(RAD(HRangl
e*15)))) (AE6A)
5610newHR=HRangle+diff/15 (27
DB)
5620: (B699)
5630A=(r*SIN(RAD(DEC))-psinthe
ta)/(r*COS(RAD(DEC))*COS(RAD(
HRangle*15))-pcostheta) (02E1)
5640parDEC=DEG(ATN(COS(RAD(ne
wHR*15))*A)) (BE9B)
5650=parDEC (2949)
5660: (F31A)
5670DEF PROCparallax(RA,DEC,G
MT,lon,lat,yr%,mth%,dt%,height
%,MoonCorrectAnom,EQUENCorct)
(8A67)
5680LOCAL LST,hrangle (7A0B)
5690: (D60F)
5700lunarEC=0.054900 (EB47)
5710axm=384401 (0D1E)
5720par=0.9507 (00AE)
5730asz=0.5181 (F2AB)
5740: (45CF)
5750dist=(axm*(1-lunarEC^2))/
(1+lunarEC*COS(RAD(MoonCorrect
Anom+EQUENCorct))) (97A2)
5760absdist=dist/axm (FEBA)
5770horpar=par/absdist (4CA5)
5780angsize=asz/absdist (F340
)
5790: (D23A)
5800LST=FNgmtT01st(GMT,yr%,mt
h%,dt%,lon) (6AFB)
5810hrangle=LST-RA (6464)
5820: (BF8F)
5830apRA=FNparlxRA(height%,la
t,hrangle,dist,RA,DEC) (D6DE)
5840apDEC=FNparlxDEC(height%,
lat,hrangle,dist,RA,DEC) (F9F3
)
5850ENDPROC (256C)
5860: (CA0C)
5870DEF PROCazmRISESET(avANGs
ize,avDEC,lat) (6ADC)
5880LOCAL As,Ar,R,X,PSI,diff
(C1BA)
5890Ar=DEG(ACS(SIN(RAD(avDEC)
)/COS(RAD(lat)))) (337C)
5900As=360-Ar (1CB1)
5910: (602A)
5920R=0.567 (316E)
5930X=R+avANGsize/2 (38D0)
5940PSI=DEG(ACS(SIN(RAD(lat))
/COS(RAD(avDEC)))) (064B)
5950diff=DEG(ASN(TAN(RAD(X))/
TAN(RAD(PSI)))) (F71E)
5960ArNEW=Ar-diff (1A7B)
5970AsNEW=As+diff (5278)
5980ENDPROC (BA72)
5990: (EB2C)
6000DEF FNwriteGMT(hr%,min%)
(SA34)
6010LOCAL hr$,min$ (294F)
6020hr$=STR$(hr%): IF LEN(hr$)
<2 hr$="0"+hr$ (E157)
6030min$=STR$(min%): IF LEN(mi
n$)<2 min$="0"+min$ (BE46)
6040=hr$+":"+min$+ " GMT " (B5
61)
6050: (FC63)
6060DEF PROCinit (404D)
6070LOCAL M% (5B2E)
6080DIM MTH$(12) (EBAB)
6090DATA Jan, Feb, Mar, Apr, May,
Jun, Jul, Aug, Sep, Oct, Nov, Dec (0
FB0)
6100FOR M%=1 TO 12 (B0F3)
6110READ MTH$(M%) (D6D3)
6120NEXT (C6BD)
6130ENDPROC (680C)
6140: (A126)
6150DEF FNadjust(A,B,angle) (
B6FB)
6160IF SGN(A)=1 AND SGN(B)=-1
THEN angle=angle+180 (BD4E)
6170IF SGN(A)=-1 AND SGN(B)=1
THEN angle=angle+360 (F09E)
6180IF SGN(A)=-1 AND SGN(B)=-
1 THEN angle=angle+180 (32AB)
6190=angle (F33C)
6200: (E8FA)
6210DEF FNyesno (6F13)
6220LOCAL G%:*FX21,0 (B21F)
6230REPEAT G%=CHR$(GET AND223
):UNTIL INSTR("YN",G%) (E1ED)
6240=G% (4C91)
6250: (F409)
6260DEF PROCerror (66FC)
6270IF ERR=17 CHAIN "MENU" (D
19F)
6280PRINT:REPORT:PRINT" at 1
ine";ERL (4498)
6290ENDPROC (58D7)
6300: (ECCF)
6310DEF PROCcontinue (8FD6)
6320PRINT"SPC8;CHR#135;CHR#15
7;CHR#129;"Press 'SHIFT' key
";CHR#156 (C848)
6330*FX21,0 (C12E)
6340REPEAT UNTIL INKEY-1 (88E
A)
6350ENDPROC (866E)
6360: (1BAC)
6370DEF FNjuliandate(yr%,mth%
,dt%,GMT) (2FAB)
6380LOCAL YR%,MTH%,AZ%,B%,C%,D
% (9414)
6390YR%=yr%:MTH%=mth%: IF mth%
=1 OR mth%=2 YR%=yr%-1:MTH%=MT
H%+12 (2DB5)
6400AZ%=YR% DIV 100 (6F5A)
6410B%=2-AZ%+AZ% DIV 4 (77B4)
6420C%=INT(365.25*YR%) (F14C)
6430D%=INT(30.6001*(MTH%+1))
(901D)
6440=B%+C%+D%+dt%+GMT/24+1720
994.5 (E332)
6450: (ECB7)
6460DEF PROCnone(date$,LAT$,L
ON$,height%) (DEFB)
6470CLS (619B)
6480PRINT"CHR#135;CHR#157;CHR
#129;LAT$;CHR#156"CHR#135;CHR
#157;CHR#129;LON$;CHR#156"CHR
#132;CHR#157;CHR#135;height%:"
metre(s) above sea-level";CH
R#156""SPC10;CHR#131;CHR#157;
CHR#132;date$;CHR#156 (335B)
6490PRINT"SPC3;CHR#131;"No d
iurnal rising and setting." (1
D3B)
6500PROCcontinue (5D74)
6510ENDPROC (7CA4)
6520: (4691)
6530DEF FNcheck(DEC,lat) (EBB
0)
6540check=-1*TAN(RAD(lat))*TA
N(RAD(DEC))<=1 AND -1*TAN(RAD(
lat))*TAN(RAD(DEC))>=-1 (EE54)
6550=check (FDF2)

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SOFT SALE

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Venturescapes	DB48			
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Mode 7 Utilities	DB12			
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Combat Zone	DB21		DB32	
Procyon	EB1			
Easyword	DB22			DE22
Videobase	DB24			
Delivery	DB25			
Easy Font	DB26	DB39	DB44	
ADFS Menu	DB27	DB31		
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double disk					double disk				
Adventurescape III	DB20	yes	yes	£15.00	Games Compendium I	DB45	no	yes	£10.00
ADFS	DB28	yes	yes	£15.00	Electron +3	DE45	no	yes	£12.00
					Home Office	DB46	yes	yes	£6.00
Compact 3½	DB35	no	yes	£17.00	double disk				
Combat Zone	DB21	yes	yes	£6.00	Graphics Construction Set	DB49	yes	yes	£10.00
Compact 3½	DB32	no	yes	£8.00	ADFS	DB50	no	yes	£10.00
Procyon	EB1	EPROM only		£11.50	Compact 3½	DB51	no	yes	£12.00
Easyword	DB22	yes	yes	£7.50	double disk				
Electron +3	DE22	no	yes	£9.50	Compact 100	DB52	no	yes	£15.00

Global View Suite

This Global View package incorporates full global graphical displays of the seasons, day and night; alternative maps; continental drift; equidistance maps; a module to design your own world; model globes — section printouts with which to make your own model globes, of the earth today, 1 million years ago, or a planet of your own making!

With the Pangaea programs you can go back to a time when the world didn't look quite the same! You can run through the history of the earth's development up to the present day. Further background information and additional graphics (of fauna and wildlife) are displayed for each period. You can even go into a predictive sequence to see what the earth may look like to future astronauts lucky enough to look down upon its surface.

Our animation programs incorporate a DUMP key so that any of the screen windows can be saved to disk from any of the Global View suite of programs under a unique filename determined by the month/day/time parameters.

These displays are then retrieved from disk in sequence. Different screen windows can be animated up to the capacity of your disk drives. When using RAM disk, the effects are even more stunning.

HAM Radio enthusiasts who wish to update the on screen information at regular time intervals will find this upgrade invaluable.

As well as full on screen instructions, the package comes complete with necessary documentation. The whole suite is a uniquely educational and enjoyable package for the BBC Microcomputer, Model B, B+ or Master 128 (this version supplied on one ADFS disk). On two DFS disks for just £10.00.

A single disk Electron +3 version of the suite contains all the above but not the animation facilities, which the hardware does not support.

- BBC Model B/B+ disk £10.00
Order product number DB01
- Master 128 ADFS disk £10.00
Order product number DB16
- Electron +3 disk £12.00
Order product number DE06
- Master Compact 3.5" ADFS disk £12.00
Order product number DB33

Mode 7 Utilities

A full Mode 7 suite. Scrolling, text and graphics editor, pixel plotting, automatic conversion of Teletext screens to BASIC, a Mode 7 screen dump and frame management. Disc only.

- BBC Model B/B+/Master disk £6.00
Order product number DB12

Master Series Software

Use your B+, Master 128 or Master Compact to the full with these programs which make use of shadow or sideways RAM and the ADFS filing system

Since we have supported the B+ and the Master 128 heavily in A&B Computing it seems only right to make software available which utilises some of the new features of these machines. We are also making software available on 3.5" disk suitable for the Master Compact.

The following Soft Sale products are all available for the Master 128 or Compact (for full details see the individual entries in the Soft Sale):

- Graphics Construction Set
- ADFS Menu
- Easy Font
- Combat Zone
- Global View Suite
- Adventurescape III
- Graphics Packs 1 and 2

The following DFS format disks are also compatible with the Master 128:

- Musician
- Venturescapes
- Games Compendium
- Educational Compendium
- Mode 7 Utilities
- Home Office
- Delivery double disk

And NOW, there's the COMPACT 100

100! programs for the Master Compact including arcade and adventure games, programming and business utilities, educational software, graphics, music and Mode 7. One and a half megabytes of software on two 3.5" ADFS disks. Master Compact only.

- BBC Master Compact 3.5" disks (2) £15.00
- Order product number DB52

Look up any A&B article, news item or listing with the A&B Bibliography

The A&B Computing Bibliography contains every reference relevant to the BBC Micro from every issue of A&B Computing since May 1983. The Bibliography is sold in parts, each containing an average of over 1,300 references.

The Bibliography contains information on all listings of games, educational and utility programs, including later corrections, updates and enhancements; reviews of hardware, firmware, peripherals, software and books; articles of specific and general interest, such as programming techniques for beginners and the experienced, writing adventure programs, computer implementation and applications etc. It even contains every news item and reader's letter; in fact, anything remotely related to the BBC Micro!

Unique Reference

Each reference has 5 components- the *title* of the reference; a *description* of contents, including keywords and the major areas covered; title of magazine; the *date* of publication and the *page* number. The references are stored in chronologically ordered sections, each chaining the next, and the user may specify the starting month and year.

Main Options

The Bibliography offers 3 options:

(1) View the whole Bibliography from May 1983 onwards. (2) View it from a specific section, missing out earlier ones. (3) A choice of a one or two-string search of the Bibliography.

For the *one-string search*, all the references containing the string will be presented, whether it is in upper-case, lower-case or a combination of both eg "PRINTER", "disc", "Graphics" or "UserRAM". It can also present references from one month (eg Nov'85).

For the *two-string search*, only references containing both strings are presented eg "LISTING" and "WORDWISE"; "PRINTER" and "REVIEW".

This is obviously a most useful and versatile option with numerous possibilities for finding that reference that you knew was there somewhere, in some magazine or other; for example, it can find that hint or tip that solves your programming problem, or find all those reviews you need to read before making your final choice and spending your money on hardware or a peripheral!

You can find all references to a particular topic, such as robotics or interfacing. It is also ideal for cataloguing, cross-referencing and indexing your magazine collection according to subject, content, date etc.

Printer or Screen

The user can specify screen or hard copy. For *screen presentation*, references are displayed one at a time without *split* words and descriptions are left and right justified. When any key is pressed the screen clears and the next one is presented.

The printer hard copy can be global or selective for all three options and references are formatted for 40, 80 or 120 columns. For example, with global printing of *option 3*, all the sections are automatically searched and chained and only references containing the specified string(s) are printed; with selective printing, the user chooses whether each reference is to be dumped to the printer, after reading it on the screen.

The software is user-friendly. The constant on-screen information provides details of the option chosen, the strings being searched for, global/selective printing or

printer off, and the month currently being searched. The Bibliography is available for 40 or 80-track disc drives and it is updated regularly. It currently comprises two discs, A&B May '83 to April '85 and A&B May '85 to May '86.

Available From

The Bibliography is produced by Jim McHugh of Mc Hugh Enterprises and is available from A&B Computing Reader Services.

- BBC Model B/B+/Master 128 disc
- Order product number DB40

An unparalleled collection of graphics software direct from A&B Computing

Graphics Construction Set

This two disk set provides two 'studios' for the computer graphic artist: an *animation* studio and a *three dimensional graphics* studio.

Quickstep provides routines for the rapid display of graphics in quick succession in a special screen Mode, resulting in fast animation of your existing static drawings. Generation and animation are two separate processes resulting in high speed redrawing from graphics data. The sideways RAM option further increases Quickstep's animating abilities.

3D Construction Set is a suite of programs, *Design*, *Rotate* and *Perspective*, which allow three dimensional structures to be designed, edited and displayed on screen. Both Mode 0 and Mode 1 are available. 3D Construction Set is equally at home helping you to design practical structures or inspired sculptures.

Full instructions for both studios are supplied in an accompanying manual.

- Model B/B+ disk £10
- Order product number DB49
- Master 128 with ADFS disk £10
- Order product number DB50
- Master Compact 3.5 disk £12
- Order product number DB51

A&B Graphics Pack 1

Four great programs for computer artists/art departments. Documentation supplied. **Ikona** A&B's own answer to mouse software with full graphics facilities and icon editing. Keyboard or joystick.

Touch of Class A very classy printer graphics program (Epson FX80 compatible) for designing and dumping personalised letter heads.

Mosaic Multicoloured building blocks for your own cartoon characters, landscapes and sprites.

ON LINE

Well, the event that you have all been waiting for has finally arrived. Get to it and complete our *communications survey* and you could win the star prize of a Pace Linnet modem, or a runners-up prize of BBC Soft's Modem Master communications software. Both these products were reviewed in last month's *OnLine* column so read the reviews to see what you could win. Remember, by completing our survey you can help us tailor our communications coverage to suit *your* needs.

Electronic mail pen pals

This month I've received a mailbox from just about the furthest place away from here — Claremont, Western Australia. (Yes, A&B can be found as far away as Australia!)

Ken Hopkins is the head of computing at Christ Church Grammar School, Claremont, Western Australia, and he would like to get in touch with British teachers who would like to communicate with him, and whose classes might like to exchange electronic mail with his classes. (Electronic mail pen pals — now that's what I call putting e+mail to a good use!)

The computer department at Christ Church uses an Econet system, now four years old, with 24 Model Bs, two 6502 second processor file servers, both supporting a 60 Mbyte Winchester hard disc drive. The school also has six stand-alone Master 128s, and the preparatory school has another 15 Master 128s. The administration department also uses a couple of Beebs for running a timetable support database and house administration. All in all an impressive setup.

You might also be interested to know that *down under* about one third of the non-government schools in Western Australia use Acorn BBC Econet systems, of which there are approximately 25 using the good old Model B as terminals. Government primary schools also use the Model B extensively. It has even been noted that a few Compacts have recently started to appear.

Ken Hopkins can be contacted on Dialcom (Telecom Gold) mailbox 07:HLI001 (soon to change to 6007:HLI001), or The Source mailbox TI4126.

If there are teachers, or come to that, anyone who would like to become an electronic mail pen pal, then drop me a message (by Dialcom (Telecom Gold) mailbox) and I'll try and sort something out.

Trinitas Phasor 2221 gets BAPT approval

The Trinitas Phasor 2221 modem marketed by Aaronfay Marketing Limited has become BAPT

Complete our communications survey and you could win a fantastic prize!

approved. The modem costs £295.00 +VAT and offers V21 (300/300) and V22 (1200/1200) operation, Hayes compatibility, auto-dial, auto-answer, call progress monitor, and internal telephone number directory.

Further information can be obtained from Aaronfay Marketing Limited, 134 Woodbridge Road, Ipswich, Suffolk, IP4 2NS. Telephone 0473-215719, Telecom Gold mailbox 72:MAG90488, Prestel mailbox 91999978.

Automated communications with the D package from Aldoda

The long awaited communications package called *D* from Aldoda International is finally on its way.

D is an intelligent communications package. It offers all the usual features found on standard communications software plus the ability to handle the majority of communications needs totally automatically.

This means that, for instance, *D* will connect and logon to an electronic mail service (such as Telecom Gold), send pre-prepared messages, read any incoming mail and store it on disc, and then finally logoff. The beauty is that this is done fully *automatically* and requires no human intervention.

It carries this out intelligently, deleting any files no longer required, saving only the mail itself to disc and not all those superfluous prompts that are sent along with the messages.

D is a communications *language*. It is extremely easy to program and uses plain English commands that are easily understood, eg: **WAIT FOR "Please Logon"**
SEND "72:MAG11090"

The *D* language is controlled by *DO* files which tell *D* what to do (quite obvious really!). The language is modular thus allowing a library of standard routines to be created.

The language is structured and allows complex files to be created quickly and easily. Procedures can be utilised from either within

the *DO* file or from within standard routines stored on disc.

D uses extensive dialogue commands between itself and the user, thus letting the user know exactly what is going on. For example the user would be informed that *D* is connecting, logging on, checking for mail, reading mail and so on.

The *D* language offers logical commands. For example it can be told to search a database for information on *A Big Company Ltd* and to request a copy of full financial information on the company *IF* the company is in liquidation *OR* there is a credit warning *OTHERWISE* request brief details only then logoff and disconnect.

D has intelligent housekeeping keeping storage charges to a minimum. *D* automatically deletes any work files that have been created and are no longer required.

Some users are members of a multiplicity of online services. *D* offers the ability to have a common user interface. This means that messages are prepared in precisely the same format no matter which service will be used to send it. The choices presented are similar thereby minimising the time spent having to learn how to use a new service because *D* knows the peculiarities of each service.

D is supplied on a dual format 40/80 track disc and comprises *D*, the communications libraries, and sample *DO* files for accessing Telecom Gold, Microlink, TTNS, and Prestel. The package is suitable for use with any modem and costs £39.00.

Squeak at Prestel

Also to be released from Aldoda International is a mouse driven Prestel terminal emulator called *Squeak*. (Where do they get their names from?)

Squeak is a Prestel terminal based upon the popular AMX Mouse (although *Squeak* can work without the mouse). *Squeak* is the only mouse-driven terminal for the BBC microcomputers and allows Prestel (and similar viewdatabases) to be accessed without ever having to touch the keyboard! The package has the usual WIMP environment (Windows, Icons, Mouse, Pointer).

Squeak displays viewdata frames in either Mode 7 or Mode 1 (with will then only occupy three-quarters of the screen) with redefinable colours. There's an on-screen numeric keyboard and on-screen timer to monitor the dreaded phone bill!

There are ikons on-screen to get the *next* frame, *last* frame, *repeat* frame, and to initialise telesoftware download. Selection of Prestel menu items can be made directly by placing the pointer over the desired option and clicking one of the mouse buttons.

Frames can be stored to disc for later retrieval and dumping to a printer. Fast text-only and high quality graphic dumps are available for Epson compatible printers.

Prestel pages can be selected from pull-down menus, with the option to create your own menus. Pre-written mail can be automatically sent. Squeak can cope with files created with either View, Wordwise, Edit, and other wordprocessors.

Fonts are available for different viewdata character sets. This enables Squeak to be able to display frames from viewdata services in other countries.

Squeak can be controlled by either keyboard, joystick or mouse and requires the AMX Super ROM to be present. Squeak is compatible with all V21 (300/300), V23 (1200/75), V22 (1200/1200), and V22bis (2400/2400) modems.

Squeak is supplied as a 16K ROM plus disk for £24.50, or disk only (for sideways RAM users) for £22.00.

Further information can be obtained from Aldoda International Limited, 27 Elizabeth Mews, Hampstead, London NW3 4UH. Telephone 01-586 5686, Telecom Gold mailbox 72:DTB10179, Prestel mailbox 017944999, Compuserve mailbox 70346.1501, and The Source mailbox ST3340.

Healthdata "Off Line"

Healthdata, the on-line health information viewdatabase is now available in an *Off-line* form. An 80 track disc is available containing a selection of some of the most important and relevant material from the Healthdata database.

When the disc is booted up the program simulates the viewdatabase system, enabling you to get the *feel and look* of the viewdata system without incurring any expensive telephone charges.

The database contains medical information suitable for both adults, and children of secondary school age. A majority of the information contained is relevant to the human biology GCSE exam and personal and social education. The system also has potential for public libraries, or in the waiting areas of clinics, surgeries or health centres.

Options are selected from menu screens with the press of a key. A carousel facility is also provided enabling a preset list of screens to be constantly displayed. Individual frames can also be saved to disc for later retrieval.

A selection of the topics covered on the disc include: child health, vaccination, vitamins, weight reduction, Aids, alcohol, pollution, smoking, cancer tests, drug abuse, pregnancy, and many others.

Healthdata "Off-Line" is available on 5 1/4" disc format for the BBC, B+, and Master computers at £9.95, or on 3 1/2" disc suitable for the Master Compact costing £11.95. A version suitable for Econet systems is available on 5 1/4" disc format for £18.90, which enables all users on the network access to the database. Due to the size of the software, it will only fit onto an 80 track disc.

The Healthdata disc can be obtained from Healthdata, 21 Vicars Close, London, E9 7HT.

Bulletin board updates

Healthdata updated

While I'm on the subject of the Healthdata viewdatabase I should mention that a few major changes have happened to the system. The viewdatabase is now running on an Econet system using the Acorn *Filestore* with a 20 MByte winchester hard disc drive, and four micros, although only one is used for the board — the others allow the system to be edited and updated whilst still on line. The host software to run on the Econet system was written by Graham Bartram of BBC Soft fame, who is incidentally, also the author of the Advanced Teletext System (ATS) ROM.

Swafax expansion

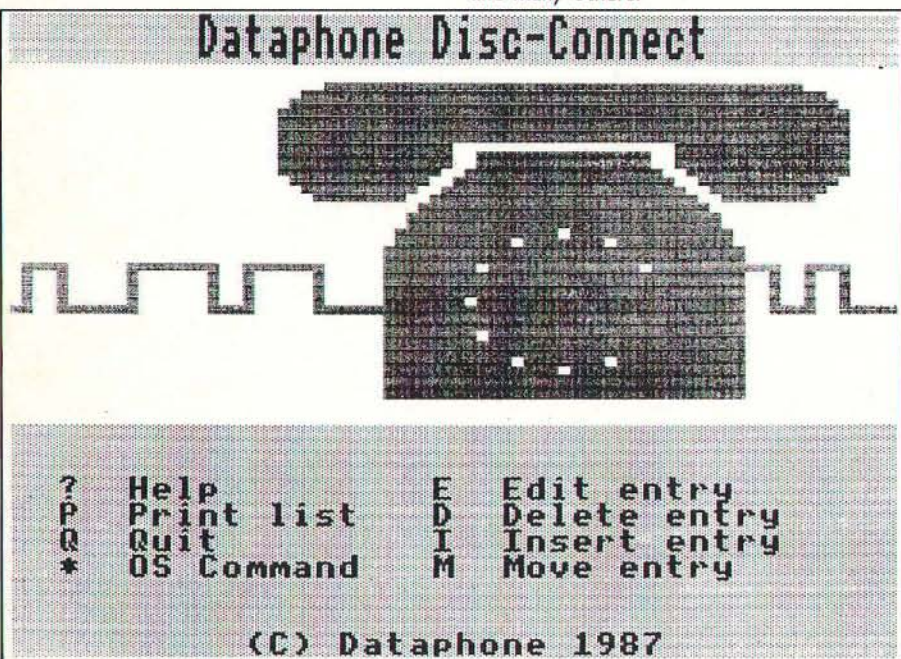
Swafax, the viewdatabases operated by the pupils at Swadelands School, Lenham, Kent, has expanded and now offers more features than before. Last christmas Swafax received a £3000 grant to upgrade their database and hence purchased a SJ Research Fileserver, 20 MByte winchester hard disc, and new software.

The software required to operate Swafax was written by The Great Goblin (Glyn Phillips, of *The Gnome at Home* fame) and offers online editing, a messaging service for registered users, XMODEM uploading and downloading of files, and Babble Boards. Later in this year dynamic frames should start to appear. (Dynamic frames are where, for instance, parts of the frame are constantly transmitted but with slight changes, normally resulting in background colours constantly changing — Epnitex style.)

The new software also allows for Swafax 1 and Swafax 3, which are both on the same site at Swadelands school, to be linked together, thus saving the bother of having to dial the other board. Swafax 2 resides in Suffolk at Timestep Electronics Limited who are one of Swafax's sponsors.

Swafax originally started out as an extra-curricular activity and has now become a vehicle for curriculum development in the county of Kent. Geography teachers have been meeting regularly and hope to produce teaching materials in the near future that will make use of the weather satellite pictures that Swafax produces.

The *Swafax Kids*, as they are called, are



Get the right connections — use "Disc Connect"

Dataphone Limited have released their *Disc Connect* autodialler software for the Demon modem (and suitable compatibles).

Disc-Connect is a disc-based autodialler that can store literally hundreds of telephone numbers. When the program is run you are presented with the list of the stored numbers, which can be scrolled through by either using the cursor keys or a joystick. The numbers can also be selected by using 'short' codes, eg entering *PRES* for the Prestel number, *GOLD*

for Telecom Gold. Once a service has been selected details are then displayed of the telephone number, operating times, baud and parity rates, etc.

Once the number has been dialled and connection successfully made the program will drop into the Demon Zromm (if fitted) otherwise you are prompted to enter your terminal software.

Disc-Connect is available on dual-format 40/80 track 5 1/4" disc costing £6.50 inclusive of VAT and P&P from Dataphone Limited, 22 Alfric Square, Woodston, Peterborough, PE2 0JP. Telephone 0722-230240, Prestel mailbox 733230240.

certainly most enthusiastic when it comes to the Swafax databases. Some of them have their own areas on the databases — enter some of them at your own peril!

Swafax 1 is this country's first and best known weather satellite database. Information is available on the equipment needed to enable satellite pictures to be captured, along with satellite times. The database contains such satellite pictures which can be downloaded and displayed on the BBC microcomputers.

There is also the latest news which comes direct from the NOAA (National Oceanic Atmospheric Agency) in America.

Swafax 2 contains similar information to Swafax 1 but doesn't have the pictures for callers to download.

Swafax 3 is a viewdatabase run by the children for children. Any schools with younger children should take a look at this database.

At the moment many teachers, just like Victor Jourg who supervises Swafax, are engaged in preparing GCSE assignments for the new examination. If any teachers have good and well-tested GCSE assignments that they would like to put in a Swafax bank for schools to access via their free DTI modem, then Swafax would be pleased to make room for them. Contact Swafax at the address below for further information.

A&B Computing now has its own section on the Swafax 3 viewdatabase where you will be able to find information about the contents

of the latest issues of A&B Computing and Disk User and of course free telesoftware. The software on offer will be a selection of some of the listings that appear in each month's A&B — no more sore fingers from typing, just go online and download the programs.

The Swafax databases can be found operating 24 hours a day, at 1200/75 baud rates on: Swafax 1 on 0622-850440, Swafax 2 on 0440-820002, Swafax 3 on 06222-858304.

Swafax can be contacted at Swafax, Vertrufe, Brooke Road, Ashford, Kent, TN24 8HN. Prestel mailbox 019996920, Telecom Gold mailboxes 01:TCD100083 or 72:MAG95296, Epnitex mailbox 196733.

Healthdata and Swafax merger

Both Dr Christopher Dobbing of Healthdata and Victor Young of Swafax are conscious of the cost of accessing databases by telephone and are therefore planning a merger in the near future. This will enable London and Kent callers to access these great databases at local telephone call rates.

Christopher Dobbing and Victor Young both believe that the way forward is by merging with other viewdatabases with similar systems in other parts of the country. Both viewdatabases are committed to free access.

Contact!

Any appropriate press releases are always most welcome and should also be sent to me at the usual address.

I can be contacted by:

- 1) writing to be by snail mail, Dave Somers, A&B Computing, Argus Specialist Publications Limited, Number One Golden Square, London, W1R 3AB.
- 2) Telecom Gold (Dialcom) mailbox 72:MAG11090
- 3) Prestel mailbox 819990565
- 4) Telex 265871 MONREF G quoting reference 72:MAG11090
- 5) via *Sirius* BB, on 01-542 3772, online Saturdays 1900-0200 hrs, Sundays 1200-0200hrs, and Mondays 1900-0200 hrs. *Please observe these operating times!*
- 6) via Mektronic Consultants *Computer Line* on 061-773 7739, 24 hours a day. (At the main menu type **MA 14** to take you straight to the A&B messaging section).
- 7) via Swafax viewdatabases on 0622-850440, 0440-820002, 0622-858304, 24 hours a day, 1200/75 baud. Viewdata software required.

Please remember that whenever references are made to databases, it should be assumed that they operate at 300/300 (V21) and 1200/75 (V23) with 8 bit data word, no parity, and 1 stop bit (8n1), scrolling ASCII (TTY) terminal software required, unless otherwise stated.

Communications Survey

You may have noticed that over the past few months that A&B has been concentrating more seriously on communications. To help us tailor our communications coverage to suit your needs we have a *Communications Survey* that we would like you to fill in and send to us.

When you have completed the survey, cut or photocopy the page and send it off to the address below. Just in case you need an incentive, the first survey out of the hat on Monday 10th August will win a Linnet modem from Pace Micro Technology, and the next ten will win runners up prizes of copies of Modem Maser communications software from BBC Software.

The Pace Linnet modem offers 300/300, 1200/75, and 75/1200 operation and will

enable you to connect to most online services. The modem is Hayes compatible and is software driven by simple 'AT' commands. The modem has battery-backup for its inbuilt 32 telephone number store, and has audio call progress monitor. These features are normally expensive additions to other modems. The Linnet modem is fully BAPT approved.

Modem Master from BBC Software is a complete communications package for both viewdata and scrolling systems. The software is able to control a variety of modems (including the above), and most of its features can be accessed by single key presses. Details of up to 40 of your favourite services can be stored and automatically dialed, with auto log facilities provided. The software works on all

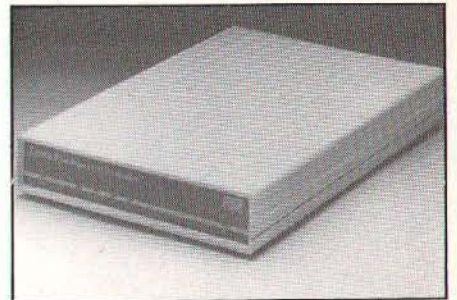


Photo of Linnet

of the BBC and Master series of microcomputers.

(A full review of these products appeared in last month's *OnLine* column.)

Your answers will, of course, be treated in the strictest confidence. Thanks in advance for providing us with the information that we require, so that we may provide the communications coverage to suit you. Dave Somers (*On Line* communications columnist)

COMMUNICATIONS SURVEY

**A&B Computing
ASP Ltd
1 Golden Square
London W1R 3AB**

1 What microcomputer do you own/use? (Please tick)

- Electron
B
B+
B+128
Master 128
Master Compact

2 Where do you use your microcomputer? (Please tick)

- Home
School
College/University
Work

3 How long have you been interested in communications? year(s)

4 Do you own/use a modem (Delete as applicable) YES/NO

5 If YES, please state: Manufacturer: Model: Age of modem:year(s)

6 What communications software do you use?

7 Do you use/have access to (Delete as applicable) teletext adaptor YES/NO telex YES/NO fax YES/NO P.S.S. YES/NO RTTY YES/NO

8 Which of the following online services are you a member of/plan to join? (Please tick)

Table with columns: Member, Plan to, Of, join. Rows: Prestel, Telecom Gold, Interspan, One To One, Mercury Link 7500, Teletel, T.T.N.S., M.U.D. (please specify), Other(s), please state

9 If you are a Prestel member, please detail any Closed User Groups (CUGs) that you are a member of:

10 If you are a member of Telecom Gold, under which user group do you belong, (if unsure, give your mailbox number).

11 Could you indicate in the table below, if appropriate, how long you have been a

member of the above services — to the nearest quarter year — and approximately how much you spend on each service per quarter?

- Member for Quarterly cost
Prestel
Telecom Gold
One To One
Interspan
Mercury Link 7500
Teletel
T.T.N.S.
MUD (please specify)
Other(s), please state

12 How much per annum do you spend on online charges?

13 How much per annum do you spend on telephone charges?

14 How much does your computer setup cost?

15 How much of this is communications related?

16 If you were to purchase a modem today, how much would you be prepared to pay? (Please tick)

- under £50
£51-£100
£101-£200
£201-£300
£301-£400
£401-£500
£500-£600
over £601

17 What features, on a scale from 1 to 3, (1 least important, 3 most important), would you like this modem to have? (Please tick 1, 2 or 3 beside each feature).

- Auto dial
Auto answer
Auto baud rate scanning
Auto speed detect
Software controlled (ie no knobs)
Modem to computer cable supplied
Moulded mains plug fitted
Good documentation
BAPT approved
Had favourable reviews

18 Which of the following speeds would you like the modem to be capable of operating at? (Please tick)

- 300/300
1200/1200
2400/2400
1200/75
75/1200

19 How would you rate the QUALITY of the communication coverage in A&B? (Please tick)

- Poor
Average

Good
Excellent

20 Do you think that the communications coverage has been (Please tick)

- Too little
All right
Too much

21 Do you think that over the past year this coverage has been getting (Please tick)

- Worse
Same
Better

22 To help us tailor our communications coverage to suit your needs, please indicate what you would like us to concentrate on (Please tick)

- less
right
more
Hardware reviews
Software reviews
Previews of new products/services
General communications news items
Reviews of online systems
Educational communications
Beginners guide to comms
Advanced users comms

23 How would you rate your level of communications knowledge? (Please tick)

- beginner
novice
proficient
expert

24 What other communications related Publications do you read?

We would be most grateful if you could complete the following section so that we may know more about our reader profiles. To be entered into the prize draw it is essential that the following section is completed

Name

Address

Telephone

We would also appreciate receiving details of your Prestel Mailbox number

Telecom Gold mailbox number

And finally, what improvements would you like to see in the way that A&B presents its communications coverage



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10 DATATECH D/S D/D 48tpi £8.50
10 TDK S/S D/D 48tpi £7.50
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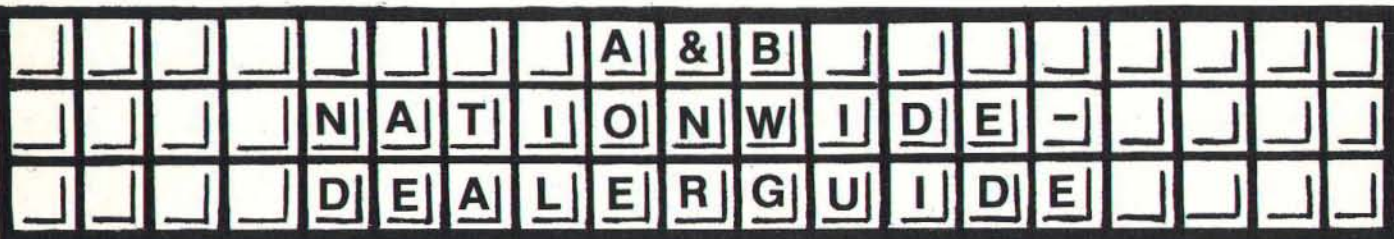
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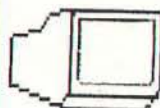
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The screen pictures show the BBC Micro version of the game.



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CODENAME: DROID

Stryker's Run - Part 2



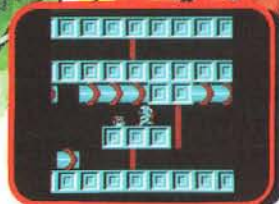
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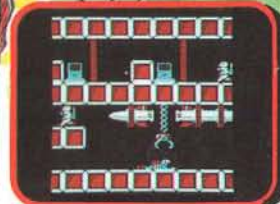
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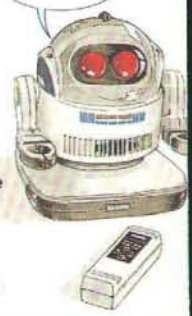
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The screen pictures show the BBC Micro version of the game. The graphics of the Acorn Electron version are identical.

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